



# LASERS AND MASERS

A CONTINUING BIBLIOGRAPHY  
WITH INDEXES

FACILITY FORM 602

**N67-37699**

ACCESSION NUMBER

(THRU)

(PAGES)

(CODE)

(NASA CR OR TMX OR AD NUMBER)

(CATEGORY)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

This bibliography was prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by Documentation Incorporated.



# LASERS AND MASERS

## A CONTINUING BIBLIOGRAPHY WITH INDEXES

A Selection of Annotated References to Unclassified Reports and Journal Articles introduced into the NASA Information System during the period February, 1966–April, 1967.



*Scientific and Technical Information Division*

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION**

WASHINGTON, D.C.

**JULY 1967**

This document is available from the Clearinghouse for Federal Scientific and Technical Information (CFSTI), Springfield, Virginia, 22151, for \$3.00.

# Introduction

With the publication of this second supplement to the Continuing Bibliography entitled "Lasers and Masers", NASA SP-7009, the National Aeronautics and Space Administration continues its program of distributing selected references to reports and articles on aerospace subjects that are currently receiving intensive study. All references have been announced in either *Scientific and Technical Aerospace Reports* (STAR), *International Aerospace Abstracts* (IAA), or the NASA Continuing Bibliography *Aerospace Medicine and Biology* (NASA SP-7011 and its supplements). They are assembled in this bibliography to provide a reliable and convenient source of information for use by scientists and engineers who require this kind of specialized compilation. In order to assure that the distribution of this information is sustained, Continuing Bibliographies are updated periodically through the publication of supplements which can be appended to the original issue.

The scope of coverage of this supplement, NASA SP-7009 (02), is extensive, and references to all major studies associated with the research on, and development of, lasers and masers are included. Special emphasis is given to laser and maser applications as they relate to ranging and communications systems, astronomy and optics, and metalworking. Pertinent references to fundamental studies devoted to the physical and electronic properties of lasers and masers, as well as their function and performance, will also be found in this collection.

Each entry in the bibliography consists of a citation and an abstract. The listing of entries is arranged in two major groups. Report literature references are contained in the first group and are arranged according to their date of announcement in STAR. The second group includes published literature references, arranged according to their date of announcement in IAA, or in *Aerospace Medicine and Biology*. All reports and articles cited were introduced into the NASA information system during the period February, 1966–April, 1967.

A subject index and a personal author index are included. These indexes use the Notation of Content (NOC), a one-sentence description of the contents of a document, rather than the title, to aid the user in locating pertinent entries.

# AVAILABILITY OF DOCUMENTS

## STAR Entries (N Series)

NASA documents listed are available without charge to:

1. NASA Offices, Centers, contractors, subcontractors, grantees, and consultants.
2. Other U.S. Government agencies and their contractors.
3. Libraries in the United States that maintain collections of NASA documents for public reference.
4. Other organizations in the United States have a need for NASA documents in work related to the aerospace program.
5. Foreign government or academic (university) organizations that have established reciprocal arrangements for the exchange of publications with NASA, that have current agreements for scientific and technical cooperative activities with NASA, or that have arrangements with NASA to maintain collections of NASA documents for public use.

Department of Defense documents (identified by the "AD" number in the citation) are available without charge to U.S. Government-sponsored research and development activities from the Defense Documentation Center (DDC), Cameron Station, Alexandria, Virginia 22314. Department of Defense documents are not available from NASA.

Other non-NASA documents are provided by NASA without charge only to NASA Offices, Centers, contractors, subcontractors, grantees, and consultants. Foreign non-copy-righted documents will be provided to U.S. Government Agencies and their contractors. AGARD reports that are not commercially available will be made available on the same basis as NASA documents.

Documents that have been placed on microfiche are identified with the symbol #. Microfiche are available on the same basis as hard-copy.

The public may purchase the documents listed from either of two sales agencies, as specifically identified in the citations.

Clearinghouse for Federal Scientific  
and Technical Information (CFSTI),  
Springfield, Virginia 22151

Superintendent of Documents  
U.S. Government Printing Office (GPO)  
Washington, D.C. 20502

Information on the availability of this publication and other reports covering NASA scientific and technical information may be obtained by writing to:

Scientific and Technical Information Division  
National Aeronautics and Space Administration  
Code USS-AD  
Washington, D.C. 20546.

*Collections of NASA documents are currently on file in the organizations listed on the inside of the back cover.*

*(continued)*

## IAA Entries (A Series)

All articles listed are available from the American Institute of Aeronautics and Astronautics, Inc. Individual and Corporate AIAA Members in the United States and Canada may borrow publications without charge. Interlibrary loan privileges are extended to the libraries of government agencies and of academic nonprofit institutions in the United States and Canada. Loan requests may be made by mail, telephone, telegram, or in person. Additional information about lending, photocopying, and reference service will be furnished on request. Address all inquiries to:

Technical Information Service  
American Institute of Aeronautics and Astronautics, Inc.  
750 Third Avenue, New York, New York 10017

For further details please consult the *Introductions* to *STAR* and *IAA*, respectively.

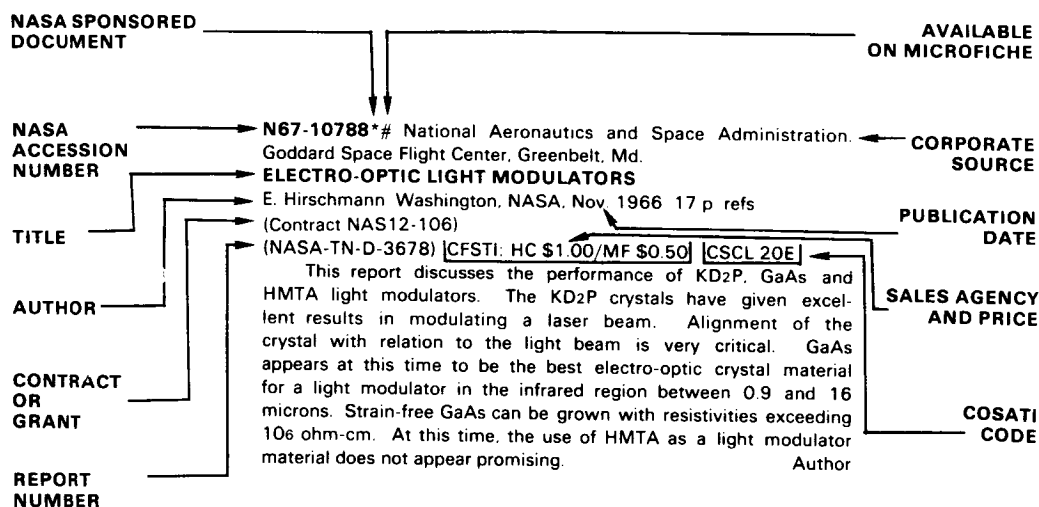
## LC Entries

Articles listed are available in the journals in which they appeared. They may be borrowed or consulted in libraries maintaining sets of these journals. In some instances, reprints may be available from the journal offices.

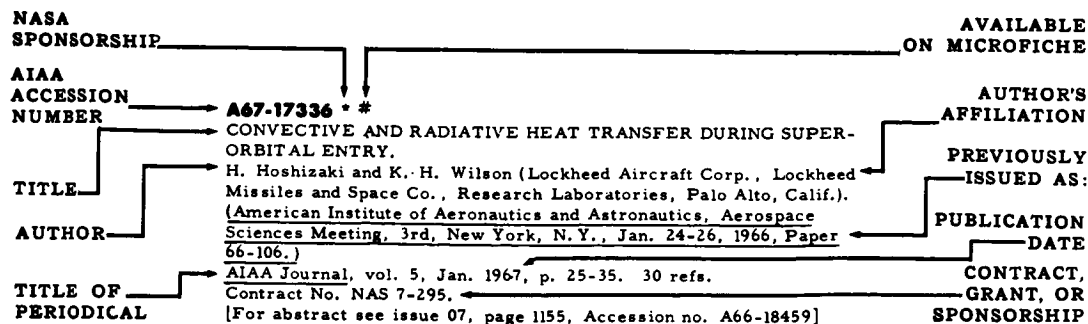
# TABLE OF CONTENTS

	Page
1966 STAR Entries (N66 Series) . . . . .	1
1967 STAR Entries (N67 Series) . . . . .	28
1966 IAA Entries (A66 Series) . . . . .	45
1967 IAA Entries (A67 Series) . . . . .	142
1966 LC Entries (A80 Series) . . . . .	199
1967 LC Entries (A80 Series) . . . . .	200
Subject Index . . . . .	I-1
Personal Author Index . . . . .	I-153

## TYPICAL CITATION AND ABSTRACT FROM STAR



## TYPICAL CITATION AND ABSTRACT FROM IAA





# Lasers and Masers

*a continuing bibliography with indexes* JULY 1967

## 1966 STAR ENTRIES

**N66-23942#** Lincoln Lab., Mass. Inst. of Tech., Lexington.  
**SOLID STATE RESEARCH Quarterly Technical Summary**  
**Report, 1 Aug.-31 Oct. 1965**

Alan L. Mc Whorter 14 Feb. 1966 70 p refs *Its Res. Rept.*-  
1965-3

(Contract AF 19(628)-5167)

(ESD-TDR-65-553; AD-629048) CFSTI: HC \$3.00/MF  
\$0.75

The report covers in detail the solid state research work at  
Lincoln Laboratory for the period 1 August through 31 October  
1965. The topics covered are Solid State Device Research,  
Laser Research, Materials Research, and Physics of Solids.

Author (TAB)

**N66-24104#** Stanford Univ., Calif. Microwave Lab.  
**ENERGY TRANSFER IN SOLID LASER MATERIALS Tech-**  
**nical Summary Report No. 6, 1 Aug.-31 Oct. 1965**

A. L. Schawlow et al Dec. 1965 6 p ref

(Contract Nonr-225(78); ARPA Order 306-64)

(ML-1393; AD-628076) CFSTI: HC \$1.00/MF \$0.50

Methods are studied of exciting solid materials for visible,  
and possibly ultraviolet, maser action; and of energy trans-  
fer processes between energy levels and between ions.

Author (TAB)

**N66-24728#** General Precision, Inc., Little Falls, N. J. Re-  
search Center.

**LIQUID LASER PARAMETERS Semiannual Technical Re-**  
**port, Aug. 1, 1965-Jan. 31, 1966**

Harvey Forest, Daniel Grafstein, and Aryeh H. Samuel 28 Feb.  
1966 28 p ref

(Contract Nonr-4644(00); ARPA Order 306-62; Proj. De-  
fender)

(AD-628526) CFSTI: HC \$2.60/MF \$0.50

Studies were made of europium complexes of hexamethyl  
phosphoramide triethyl phosphate, and tri-n-butyl phosphate,  
which are promising direct-excitation liquid laser materials. An  
overall quantum efficiency of 0.5 for fluorescence was meas-  
ured. It was found that complex formation is essentially com-  
plete when the Eu concentration is below 0.2 M even when  
hydrated Eu salts are used. The excess of  $^5D_0$  states required  
for laser action was calculated. A laser threshold of 6.3 watts/  
 $\text{cm}^3$  per Å interval of the absorption band is calculated on the

basis of these data for a 0.02 M europium complex in a 5 cm  
tube. Additional compounds prepared include: triethyl phos-  
phate complexes of  $\text{SmCl}_3$ ,  $\text{NdCl}_3$ ,  $\text{PrCl}_3$ , and  $\text{TbCl}_3$ , which  
resemble the  $\text{EuCl}_3$  complexes; also  $\text{EuCl}_3$  complexes with  
triphenyl phosphate, urea, thiourea, dimethyl sulfoxide, di-  
methyl formamide, dimethyl acetamide, and tetramethylurea.  
Fluorescence in the complexes having  $\text{C}=\text{O}$  and  $\text{S}=\text{O}$  ligands  
is enhanced over that in aqueous Eu solutions, but not as much  
as in  $\text{P}=\text{O}$  complexes. The formation of precipitates from  
heated  $\text{EuCl}_3$ -alkyl phosphate complexes was further studied  
and a formula for the precipitate is proposed. TAB

**N66-24735#** Air Force Systems Command, Kirtland AFB,  
N. Mex. Air Force Weapons Lab.

**ANGULAR DEPENDENCE OF SURFACE SCATTERED**  
**LASER RADIATION**

Ronald L. Grotbeck and Glenn Doughty Jan. 1966 27 p ref  
(AFWL-TR-65-220; AD-628295) CFSTI: HC \$2.00/MF \$0.50

Experiments to determine the relative intensity of light  
scattered at various angles from several materials were per-  
formed. Various target materials were mounted on an optical  
bench and illuminated by a Spectra Physics 116 gas laser. The  
targets were rotated through various angles with respect to the  
optical bench, and the distance between the detector and  
target was varied to record a constant voltage reading on a 555  
oscilloscope. Different graphs showing isointensity lines for  
various angles of incidence as well as graphs showing the  
percent of intensity reflected as a function of distance were  
then plotted.

Author (TAB)

**N66-24738#** California Univ., Berkeley, Dept. of Physics.  
**BEAM DETERIORATION AND STIMULATED RAMAN EFFECT**

Y. R. Shen and Y. J. Shaham [1965] 8 p refs

(Contract Nonr-3656(32))

(AD-628074) CFSTI: HC \$1.00/MF \$0.50

Experimental evidence is presented to suggest that scat-  
tering mechanisms in a medium can produce inhomogeneities  
or filamentary structure in an initially homogeneous laser  
beam. It is these hot filaments which are responsible for the  
many anomalous effects previously observed. TAB

**N66-24779#** Army Electronics Labs., Fort Monmouth, N. J.  
**OPTIMIZATION OF THE GALLIUM ARSENIDE INJECTION**  
**LASER FOR MAXIMUM POWER OUTPUT**

Juri Vilms, Lothar Wandinger, and Kenneth L. Kohn Nov.  
1965 29 p refs

(ECON-2613; AD-629426) CFSTI: HC \$2.60/MF \$0.50

The operating temperature of an injection laser is de-  
termined by the difference between the electrical input power  
and the coherent light output power, and by the details of

heat conduction away from the active region. Since the efficiency of the coherent light generation is a decreasing function of temperature, a maximum exists in the curve of output versus input power. A mathematical model of the injection laser is employed to investigate how this maximum output power varies as a function of several design parameters of the injection laser. The optimum design is presented for the case of continuous operation in a 77°K environment and discuss pulsed operation of low-duty cycle in a 300°K environment.

TAB

**N66-24998\*** Miami Univ., Coral Gables, Fla. School of Environmental and Planetary Sciences.

**LASER PROBING OF THE ATMOSPHERE** Semiannual Status Report

S. Fred Singer Mar. 1966 30 p refs

(Grant NGR-10-007-028)

(NASA-CR-74730) CFSTI: HC \$2.00/MF \$0.50 CSCL 20E

Details are given of a proposed light backscattering experiment to probe a hypothetical layer at about or slightly above a height of 100 km. The objectives of the experiment are to investigate the implication of G. Fiocco that some particulate matter is present in the atmosphere at this altitude. Also, observations are to be extended and performed operationally for a period of at least one year in order to determine if there is a local or a seasonal character associated with Fiocco's findings. Theoretical background and system design is considered, with the laser taken as one starting point in the design of the proposed system. Consideration is given to molecular scattering by atmospheric gases since it may provide a remote measurement of atmospheric density, and also because it will tend to obscure the presence of other scatterers such as dust particles.

C.T.C.

**N66-25226\*** Los Alamos Scientific Lab., N. Mex.

**LASL CONTROLLED THERMONUCLEAR RESEARCH PROGRAM** Semiannual Status Report, Period Ending Oct. 31, 1965

7 Dec. 1965 93 p refs

(Contract W-7405-ENG-36)

(LA-3434-MS) CFSTI: HC \$3.00/MF \$0.75

**CONTENTS:**

1. CAULKED STUFFED CUSP MINIMUM B MACHINE L. C. Burkhardt, J. N. Di Marco, and H. J. Karr p 5-12 refs
2. ELECTRON-BEAM PLASMA HEATING J. McLeod p 13 ref
3. PLASMA FOCUS EXPERIMENT J. W. Mather p 14-16 refs
4. SCYLLA IV POWER-CROWBARRED MEASUREMENTS E. M. Little, W. E. Quinn, F. L. Ribe, and G. A. Sawyer p 17-24 refs
5. SCYLLA IV OPERATION R. F. Gribble, E. M. Little, N. Lowry, L. H. McDowell, and W. E. Quinn p 25-27
6. SCYLLAC PLANS p 28-29
7. SCYLLA IV CURVED SECTOR EXPERIMENTS W. H. Borkenhagen and W. E. Quinn p 30-31
8. POSSIBLE SINGLE-TURN MIRROR INSERTS FOR SCYLLAC EXPERIMENTS D. A. Baker, R. F. Gribble, W. E. Quinn, and F. L. Ribe p 32-35 refs
9. ANALOG SOLUTION OF MULTIPOLE STABILIZING CONDUCTORS G. A. Sawyer p 36-38
10. SCYLLACITA, A SMALL THETA-PINCH MACHINE E. Dolnick, R. Dike, E. Kemp, and G. A. Sawyer p 39-41
11. SCYLLA I LASER EXPERIMENTS P. N. Mace and G. H. McCall p 42-44 ref

12. TEST OF GIANT-PULSE RUBY LASER FOR SCATTERING EXPERIMENT T. Langham, A. S. Rawcliffe, F. L. Ribe, D. Steinhaus, and K. Thomas p 45-46

13. FABRY-PEROT MONOCHROMATOR FOR SCATTERING EXPERIMENT F. L. Ribe and K. S. Thomas p 47

14. HYDROMAGNETIC PLASMA GUN PROGRAM I. Henins and J. Marshall p 48-67 refs

15. TRANSVERSE INJECTION J. E. Hammel p 68-70

16. EQUIPMENT DEVELOPMENT AND TESTING I. Henins et al p 71-81

17. NEW MATHEMATICAL PHYSICS GROUP W. B. Riesenfeld p 82-83

18. INVESTIGATION OF dl/B STABLE CLOSED SYSTEMS D. A. Baker p 84-85

19. PLASMA BOUNDARY CALCULATIONS T. A. Oliphant p 86

20. COMPUTATION OF ELECTRIC AND MAGNETIC FIELDS K. R. Crandall and H. R. Lewis p 87-88

21. MAGNETIC MOMENT SERIES H. R. Lewis p 89

22. THERMONUCLEAR REACTOR BLANKETS G. I. Bell p 90 ref

**N66-25340\*** Westinghouse Electric Corp., Pittsburgh, Pa. Research Labs.

**HIGH TEMPERATURE PLASMAS BY LASER HEATING** Quarterly Progress Report No. 3, 6 Apr.-5 Jul. 1965

A. V. Phelps 15 Jul. 1965 14 p /Its Res. Memo 65-8E2-139-M3

(Contract AT(30-1)-3472)

(TID-22132) CFSTI: HC \$1.00/MF \$0.50

The behavior and properties of laser-produced plasmas were investigated using diamagnetic loops, electrostatic probes, framing camera photography, and plasma energy absorption. Particles were successfully suspended electrostatically, but the emphasis remained on the retracting-pedestal approach.

NSA

**N66-25513\*** Lincoln Lab., Mass. Inst. of Tech., Lexington. **OPTICAL COMMUNICATIONS EMPLOYING SEMICONDUCTOR LASERS** Technical Report No. 392

Edward J. Chatterton 9 Jun. 1965 73 p refs

(Contract AF 19(628)-500)

(ESD-TDR-65-232; AD-630243) CFSTI: HC \$3.00/MF \$0.75

This report discusses the development of optical communications employing semiconductor lasers—both non-coherent and coherent. The large modulation bandwidth obtainable with these devices permits the development of frequency- and pulse-modulation communications systems which overcome scintillation noise produced by the turbulent atmosphere. Emphasis has been placed on the development of communications systems for 98-percent weather capability over short ranges, rather than fairweather capability over long ranges. The development of supporting technology is presented in the areas of semiconductor lasers, fiber optics, optical systems, narrowband optical filters, photomultipliers, and frequency- and pulse-modulation electron circuitry and components. Measurements of optical signals over a two-mile path under a full variety of weather conditions have permitted a comparative evaluation of AM, FM, and PM systems. The results show clearly the advantage of frequency modulation

**N66-25558\*** National Aeronautics and Space Administration Marshall Space Flight Center, Huntsville, Ala.

**EXPERIMENTAL MEASUREMENT OF OPTICAL ANGULAR DEVIATION CAUSED BY ATMOSPHERIC TURBULENCE AND REFRACTION**



Robert L. Kurtz and James L. Hayes Washington, NASA, May 1966 60 p refs

(NASA-TN-D-3439) CFSTI: HC \$3.00/MF \$0.50 CSCL 17H

Atmospheric turbulence causes the image of a stationary optical source to fluctuate in intensity and position. The amplitude and frequency of this random position fluctuation have been measured. Data were recorded over a period of approximately six months and over two different path lengths. The system and site are described. Data are analyzed and tabulated to show the amplitude of fluctuations in various meteorological conditions. A sample of these data is statistically analyzed to determine the limitations of an optical tracking system.

Author

**N66-25866#** Illinois Univ., Urbana. Gaseous Electronics Lab.  
**AN INVESTIGATION OF ELECTRONIC RECOMBINATION IN HELIUM AND ARGON AFTERGLOW PLASMAS BY MEANS OF LASER INTERFEROMETRIC MEASUREMENTS** Scientific Report No. 2

M. A. Gusinow, J. B. Gerardo, and J. T. Verdeyen 15 Feb. 1966 118 p refs

(Grant DA-ARO(D)-31-124-G582)

(AROD-4832-7; AD-630074) CFSTI: HC \$4.00/MF \$0.75

Two helium-neon laser interferometers were used to obtain the electron and neutral atom densities in an afterglow plasma. The interferometric technique utilized allows one to obtain both the spatial and temporal dependence of the electron decay. The two gases studied were helium and argon at 2-8 Torr and 0.3-0.8 Torr respectively. The electron density was in the range  $2 \times 10^{13} < N_e < 10^{15} \text{ cm}^{-3}$  and the electron temperature in the range  $1000 < T_e < 7000^\circ \text{K}$ . The electron temperature was measured by comparing the relative atomic line intensities and by inference from the recombination coefficient. The electronic recombination in helium, argon, and helium-argon mixtures was found to follow closely the predictions of Bates, Kingston, and McWhirter for collisional-radiative recombination (Proc. Phys. Soc. 83:43, (1964)). In the range of electron temperature and density studied the recombination coefficient exhibited an approximate  $T^{-9/2}$  dependence. The electron temperature inferred from the measured recombination coefficient indicates a pronounced electron temperature gradient across the tube which is believed to be due to electron heating effects in the afterglow.

Author (TAB)

**N66-25900#** Air Force Systems Command, Kirtland AFB, N. Mex. Air Force Weapons Lab.  
**INVESTIGATION OF A LASER TRIGGERED SPARK GAP** Technical Report, Jan. 1964-Dec. 1965

Winston K. Pendleton (Air Force Inst. of Tech.) and Arthur H. Guenther Mar. 1966 27 p refs

(AFWL-TR-65-32; AD-629905) CFSTI: HC \$2.00/MF \$0.50

The influence of parameters affecting the laser triggering of a high-voltage electrical sphere-sphere gap has been experimentally investigated. Of primary interest was the delay time between arrival of the laser pulse and current flow across the gap. This delay was studied as a function of total laser beam power (0-80 MW); dielectric gas ( $\text{SF}_6$ ,  $\text{N}_2$ , air); gas pressure (100-1400 Torr) electrode spacing (0.4-1.5 cm); gap electric field (10-100kV/cm); and focus point location between two 5 cm diam stainless steel spheres. Delay times less than 10 nsec were observed in  $\text{SF}_6$  at atmospheric pressure with corresponding low jitter. For the cases studied delay times varied inversely with the electric field, gas pressure, and focus point distance from the anode surface. Above a certain laser beam power the delay time was not a significant function of laser power for the range studied. Applications of laser triggering are discussed with a description of current and future research areas.

Author (TAB)

**N66-26252\*#** Smithsonian Astrophysical Observatory, Cambridge, Mass.

**PHOTOGRAPHIC MEASUREMENTS OF THE ENERGY DISTRIBUTION IN THE BEAM OF A RUBY LASER**

C. G. Lehr, L. A. Maestre, and P. H. Anderson 25 Mar. 1966 22 p refs

(Grant NsG-87-60)

(NASA-CR-75102; SAO Special Rept.-205) CFSTI: HC \$1.00/MF \$0.50 CSCL 20E

The beam of a Q-switched ruby laser was directed toward a diffusely reflecting target at a distance of about 1/2 mile. The image on the target was photographed with a hand camera and the resulting films were measured with a microdensitometer. Two stop-openings were used for the photographs. The films exposed with the smaller stop-opening showed concentrations of energy with intensities up to 700 times the background energy. These concentrations are probably representative of the actual laser beam but they could be diffraction effects caused by irregularities in the surface of the diffuse target. The films exposed with the larger stop-opening were used to measure this background energy. Its average value was about half the nominal value of the energy determined from calorimetric measurements. This factor of one-half may be the combined effect of several losses that were neglected in the photometric measurements. The angular divergence of the beam was also measured.

Author

**N66-26261\*#** Ohio State Univ. Research Foundation, Columbus. Dept. of Electrical Engineering.

**RECEIVER TECHNIQUES AND DETECTORS FOR USE AT MILLIMETER AND SUBMILLIMETER WAVELENGTHS** Semiannual Report, 1 Oct. 1965-31 Mar. 1966

1 Apr. 1966 11 p /Its Rept.-1093-30

(Grant NsG-74-60)

(NASA-CR-74971) CFSTI: HC \$1.00/MF \$0.50 CSCL 09F

Investigations on water vapor absorption in the submillimeter region are reported. The absorption positions are considered to agree with published theoretical values. However, a significant time delay was noticed, which had a degrading influence on measurements. Modifications in the analog-digital conversion and recording system are reported to decrease digital noise and increase reliability. The completed construction of an external-mirror  $\text{CO}_2$  laser and the initiation of a laser made of glass parts bolted together are mentioned.

N.E.N.

**N66-26341#** Air Force Cambridge Research Labs., Bedford, Mass. Optical Physics Lab.

**THERMALLY INDUCED EFFECTS IN SOLID STATE LASER RODS**

Richard Lee Townsend, Jr. Jan. 1966 45 p refs /Its Phys. Sci. Res. Paper No. 188

(AFCLR-66-57; AD-630608) CFSTI: HC \$4.60/MF \$0.50

An experiment was performed to measure changes in optical length of ruby and neodymium in glass laser rods both during and after excitation by the pump flash. A Twyman-Green interferometer was used to produce fringes, the fringe movement being correlated with changes in optical length. Movement and distortion of fringes was observed using a multiframe image converter camera. The results show that all rods expand linearly with time during the time the pump is on and that all rods develop a distortion which is dependent on the radial energy density distribution within the rod. After the pump goes off the rods begin a relaxation back to the unexcited state. The relaxation is interrupted when hot air propagates from the flash tube to the rod causing the rod to reheat and causing an extremely concave appearance. The rods then relax slowly to an equilibrium state with ruby reaching this state in much shorter times (0.4 sec) than glass due to its

higher thermal conductivity. These results stress the importance of uniform pumping if low beam divergence is to be achieved. Immersion of the rod in an index-matching infrared-absorbing fluid would be desirable not only to pump the laser uniformly but also to shield it from the infrared radiation which causes concave distortions after 20 msec. Author (TAB)

**N66-26436#** TEM-Pres. Research, Inc., State College, Pa. **LIGHT SCATTERING TECHNIQUES FOR CRYSTAL EVALUATION** Final Report, 1 Jul.-31 Dec. 1965

V. Vand, E. A. Margerum, F. Schwab, and R. I. Harker 31 Jan. 1966 111 p refs  
(Contract AF 19(628)-5213)  
(AFCRL-66-119; AD-631041) CFSTI: HC \$4.00/MF \$0.75

The work described in this report has resulted in (1) the development of the theory of light scattering by various crystal imperfections, (2) the production of computer programs for the calculation of light scattering functions, (3) the computer tabulation of specific values for scattering factors or amplitude functions, intensity functions and Mie coefficients as a function of various selected angles of scattering from 0 to 180 degrees and various sizes of spherical voids from 10 to 10,000 Å radius, (4) specific tables of the functions of  $\pi$  and  $\tau$  occurring in Mie's theory for light scattering calculations, and (5) an engineering design of an optical system utilizing a continuous laser for observing, evaluating, recording and determining the arrangement of defects in crystals.

Author (TAB)

**N66-26501#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**A RED BEAM IN THE BLACK SKY**

V. Chernyshev 1 Feb. 1966 10 p Transl. into ENGLISH from Krasnaya Zvezda (Moscow), 14 Mar. 1965 p 1  
(FTD-TT-65-1683/1+4; AD-629473) CFSTI: HC \$1.10/MF \$0.50

The importance and applications of the ruby laser in transmitting information through space is briefly reviewed. The dimensions of the laser are indicated. Some problems connected with the use of a very narrow beam in locating an object in space are outlined. It is pointed out that Doppler shifts, relative rates of motion of objects, and spacecraft velocity and direction can be measured with great accuracy using lasers.

N.E.N.

**N66-26512#** Columbia Univ., New York. Plasma Lab. **OPTICAL AND ELECTRON INTERACTIONS WITH METASTABLES**

Bertram Pariser [1965] 110 p refs  
(Contract Nonr-266(93); Proj. Defender)  
(Rept.-24; AD-627363) CFSTI: HC \$4.00/MF \$0.75

Afterglow plasmas are optically pumped with broadband radiation produced by a xenon flash lamp. The neon metastable concentration is decreased to less than 50 percent during the pumping, and a net depopulation results at the conclusion of the flash. A depopulation of the helium metastable is seen only during the pumping flash. By optically pumping neon metastables to the lower laser level, the laser lines (6328 Å and 1.15 microns) are quenched. Amplifications of the 1.15 micron laser line is observed when the population of the upper laser level is increased by selectively pumping neon metastables. Metastable collisions with heated electrons also result in a depopulation of the neon concentration. With further heating, the electrons gain enough energy to increase the metastable population by colliding with neutral neon atoms. Biondi's theory on ionizing collisions is examined while controlling the metastable population with optical pumping. The experimental data support the theory that metastable collisions are an important ionization process in an afterglow.

Author (TAB)

**N66-26570#** Illinois Univ., Urbana. Gaseous Electronics Lab. **SPECTROSCOPIC AND MICROWAVE INVESTIGATION OF LASERING PLASMAS** Scientific Report No. 4

L. A. C. Weaver and L. Goldstein Feb. 1966 177 p refs  
(Contract AF 19(628)-3307)

(AFCRL-66-89; AD-629925) CFSTI: HC \$5.00/MF \$1.00

The relationship between the process of lasering, the electron gas, and the excited state populations of the active medium are studied for the noble gas lasers. Microwave signals are employed to perturb the electron gas, and resultant alteration of laser output is investigated. The effects of lasering upon the microwave propagation constant, noise radiation temperature, discharge current and spectral emission are investigated experimentally in He-Ne gas lasers, and radiative cascade patterns in noble gases are described by an idealized theoretical model.

TAB

**N66-27060#** General Motors Corp., Indianapolis, Ind. Allison Div.

**ALLISON RESEARCH AND ENGINEERING, VOLUME NO. 9, FIRST QUARTER 1966**

1966 33 p refs

1. PLASMA DIAGNOSTICS BY MEANS OF LASERS  
D. J. Rose (MIT) p 1

2. PLASMA PROPERTIES BY SPECTROSCOPIC MEASUREMENTS H. D. Wilsted and Wolfgang Woerner p 2-17  
refs (See N66-27061 15-25)

3. TRANSMISSION DESIGN FOR AIRCRAFT GAS TURBINES W. L. McIntire and C. M. Hawkins p 18-25  
(See N66-27062 15-28)

**N66-27687#** International Business Machines Corp., Yorktown Heights, N. Y. Thomas J. Watson Research Center. **INJECTION LASER STUDY** Final Technical Report, 1 Jun. 1963-31 May 1965

K. Konnerth, F. F. Morehead, F. Stern, P. R. Wagner, and K. Weiser [1965] 79 p refs  
(Contract DA-36-039-AMC-02349(E))

(Rept.-8; AD-631499) CFSTI: HC \$3.00/MF \$0.75

Many GaAs injection laser diodes show a substantial delay between the application of a current pulse and the onset of lasing if they are operated near room temperature and at currents just above threshold. A model for this effect based on trapping of carriers gives good agreement both with the delay results and with experimental data on the time dependence of spontaneous emission for currents below threshold, provided that the density of trapping states is about ten times the threshold carrier concentration. No independent evidence for the existence of these states has been obtained. The dependence of current and light emission on voltage in CdTe diodes was studied. The current varies as  $\exp(qV/2kT)$  at low current levels, and as  $\exp(qV/kT)$  at higher current levels. Emission is observed with photon energies considerably greater than the applied voltage. Thermodynamic considerations restrict the efficiency of such radiation from one-step processes, and account in part for the low quantum efficiency found at room temperature. In GaAs structures with a high-resistance p-type layer surrounded by high-conductivity p-type layers, ambipolar negative resistance, efficient light emission, and lasing were observed. The origin of the electrons is thought to be avalanching in the strong electric field found to present in these all p-type structures.

TAB

**N66-27790#** California Univ., La Jolla. Visibility Lab. **UNDERWATER OPTICS**

S. Q. Duntley 12 Mar. 1966 25 p  
(Contract Nonr-2216(14))  
(AD-631033) CFSTI: HC \$1.00/MF \$0.50

Data taken in 1965 confirm previous measurements made with a conventional light source in 1962 and with a laser source in 1964. The data continue to indicate a difference in the propagation characteristics of the two sources. This difference is ascribed to the different beam geometries, but it disappears when an integrating sphere with a 4-inch aperture is used for a receiver and a beam compression device is employed. Thus the laser and conventional sources have similar gross propagation properties although the data still indicate the presence of scattering effects. Thus the range of underwater laser devices may be longer than anticipated. The data also indicate that appreciable portions of the irradiance is far from the axis. Author (TAB)

**N66-27897#** Massachusetts Inst. of Tech., Cambridge.  
**STUDY OF VARIOUS ASPECTS OF RAMAN SCATTERING USING C.W. OPTICAL MASERS** Semiannual Technical Summary Report No. 1, Aug. 1, 1965-Feb. 1, 1966

A. Javan 25 Mar. 1966 9 p refs  
 (Contract Nonr-3963(22); ARPA Order 306; Proj. Defender)  
 (MIT-DSR-4979; AD-631039) CFSTI: HC \$1.00/MF \$0.50

Contents: Linewidth of Raman scattering, by J. R. Murray, A. P. Sheng, J. D. Ducuing; Stimulated Raman absorption in liquids, by J. R. Murray, A. P. Sheng, J. D. Ducuing; Two photon absorption processes, by J. R. Murray, A. P. Sheng, A. Javan; Raman scattering in gases-linewidth phenomena by J. R. Murray, A. P. Sheng, A. Javan. TAB

**N66-27953\*#** Sylvania Electric Products, Inc., Mountain View, Calif. Electronic Defense Labs.

**STUDY OF VIBRATION MEASUREMENT BY LASER METHODS**

Gail A. Massey [1965] 68 p refs  
 (Contract NAS2-3137)

(NASA-CR-75643) CFSTI: HC \$3.00/MF \$0.75 CSCL 20E

A four-month study of laser techniques for detecting and measuring vibrations of a spacecraft model on a shake table has been conducted. An interference mapping technique, similar to holography in some respects, was developed. It appears that the coherent detection systems may be useful in measuring vibrations down to one micron peak amplitude or perhaps less, even on diffusely reflecting surfaces. The microwave systems provide the poorest sensitivity. The interference mapping system gives a visual indication of surface tilt or gradient of normal displacement, and thus can provide a useful map of positions of maximum and minimum displacement. Most of the systems were tested experimentally; results were generally in good agreement with the analysis. This report contains a detailed description of each approach, a comparison of the relative performances of the various systems, and recommendations for further investigation and development of the most promising techniques. Author

**N66-28300#** Library of Congress, Washington, D. C. Aerospace Technology Div.

**CHICOM STATE-OF-THE-ART IN ELECTRONICS AREA**  
**Surveys of Chinese Communist Scientific and Technical Literature**

14 Jan. 1966 16 p refs Compilation of Abstracts  
 (ATD-66-6; TT-66-61094; AD-631546) CFSTI: HC \$1.00/MF \$0.50

This compilation of abstracts is based on CHICOM open sources published 1964-1965. It is the first report in a series. The fifteen abstracts are arranged alphabetically by author. The following information is included: ammonia maser, semiconductor developments, radio transmitter, TV transmitter, calcium tungstate crystal, neodymium-containing laser, pulse laser, continuous-wave laser, subminiature radio direction finder, miniature electron tube, pentode electron tube, tunnel diode, atmospheric propagation, antenna, short

wave backscatter sounding, oscillator tube, audiofrequency carrier telegraph transmitter, teletypewriter, and carrier-wave telephone. A list of 7 Chinese journals searched in compiling the report is provided. There is no bibliography. Author (TAB)

**N66-28336#** Institut für Plasmaphysik G.m.b.H., Garching (West Germany).

**A GIANT PULSE LASER WITH A TRIGGERABLE PASSIVE Q-SWITCH PERFORMANCE**

K. Maischberger May 1966 20 p refs Presented at the 4th Symp. on Eng. Probl. in Thermonuclear Res., Frascati, Italy, 23-27 May 1966

(IPP-4/34) CFSTI: HC \$1.00/MF \$0.50

A method of ruby laser operation is described which produces fast, intense, and triggerable giant laser pulses by Q-switching with a selective saturable organic dye. The ruby rod 5/8 in. in diameter and 7 in. long is used in an ellipsoid pump configuration. The passive Q-switch element is placed between the 90° rod with a TIR chisel and a separate end mirror. A double-pulse circuit energizes a linear flash tube. A preionizing pulse fires the main capacitor bank. After a suitable delay a second trigger signal switches the energy of a capacitor to the flash tube load. This short high-power pulse, now not current limited, will start laser action corresponding to the second trigger signal on conditions which will be discussed. The jitter relative to the second trigger signal, the energy and power output of the resulting giant pulses is reported. Author

**N66-28382\*#** Cornell Aeronautical Lab., Inc., Buffalo, N. Y.  
**LASIG II: PULSED LASER ION GENERATOR STUDY**  
**Final Report**

R. E. Biss and A. S. Gilmour, Jr. 5 Oct. 1965 173 p refs  
 (Contract NAS3-5919)

(NASA-CR-54154; CAL-UB-1989-E-4) CFSTI: HC \$5.00/MF \$1.00 CSCL 20E

Thirteen materials were illuminated in vacuum with the focused output of a pulsed ruby laser. Illumination of materials such as chromium, columbium, tantalum, thorium, tungsten and zirconium resulted in the emission of ion currents of 3 to 4 amperes. Thrusts from this laser-induced emission have been measured at over 4 millipounds. An average ion energy of 40 electron volts, with a specific impulse of 660 seconds has been obtained. Measurements were made on the density and energy distribution of the emitted ions. Author

**N66-28461#** Naval Air Test Center, Patuxent River, Md.  
**A WIDEBAND ABSOLUTE ACCELEROMETER CALIBRATOR UTILIZING A LASER FOR MEASURING VIBRATION DISPLACEMENTS**

Robert B. Davis In NRL The Shock and Vibration Bull. Feb. 1966 p 33-36 (See N66-28456 16-32) CFSTI: HC \$6.00/MF \$1.25

An absolute accelerometer calibrator utilizing a laser as the standard reference has been developed. The calibrator consists of a laser photodiode and appropriate electronic readout equipment, and is easy to operate with a direct digital readout for displacements greater than one-half of a wavelength. The present resolution of the prototype calibrator is one-tenth of a wavelength. The results of this development are discussed. Author

**N66-28514#** Naval Research Lab., Washington, D. C.  
**REPORT OF NRL PROGRESS**

Apr. 1966 49 p refs  
 (PB-169690) CFSTI: \$1.25

## CONTENTS:

1. LASER ACTION IN TRIPLY ACTIVATED GLASS H. W. Gandy, R. J. Ginther, and J. F. Weller p 1-9 refs (See N66-28515 16-26)
2. RAPID ANALYSIS WITH A GAS CHROMATOGRAPH-MASS SPECTROMETER COMBINATION F. E. Saalfeld p 10-18 (See N66-28516 16-14)
3. APPLICATIONS RESEARCH Barbour L. Perry and Patricia A. Griffin p 19
4. CHEMISTRY B. J. Piersma et al p 19-21
5. METALLURGY AND CERAMICS R. J. Goode et al p 21-30 refs
6. OPTICAL PHYSICS R. C. Eckardt et al p 30-34 ref
7. RADIO C. I. Phipps p 34-36 ref
8. SOLID STATE PHYSICS S. Levinson and F. L. Carter p 36-38 refs
9. APPLICATION OF PINLITES TO A HEADS-UP DISPLAY FOR PILOTS V. Gagner p 38-40

**N66-28515#** Naval Research Lab., Washington, D. C. Radiometry Branch.

**LASER ACTION IN TRIPLY ACTIVATED GLASS**

H. W. Gandy, R. J. Ginther, and J. F. Weller *In its Rept. of NRL Progr. Apr. 1966* p 1-9 refs (See N66-28514 16-23) CFSTI: \$1.25

Pulsed optical excitation experiments performed at liquid nitrogen temperature upon confocal etalons fabricated from barium crown glass triply activated with  $\text{UO}_2^{2+}$ ,  $\text{Nd}^{3+}$ , and  $\text{Yb}^{3+}$  having indicated that either  $\text{Nd}^{3+}$  or  $\text{Yb}^{3+}$  or both ions can be excited to exhibit laser oscillations. This controllable selection of the lasing species was demonstrated in both the free running and self Q switched modes of optical resonator operation. A physical description of the processes involved in these experiments is given followed by a theoretical description of the excited state population kinetics of doubly activated luminescent systems. Author

**N66-28553#** TRG, Inc., Melville, N. Y.

**RESEARCH ON PROPERTIES OF LASER DEVICES** First Technical Summary Report, 15 Nov. 1964-15 May 1965

N. Solimene, ed. [1965] 65 p refs  
(Contract AF 49(638)-1535; ARPA Order 356; Proj. Defender)  
(TRG-034-TR-1; AD-627353) CFSTI: HC \$3.00/MF \$0.75

## CONTENTS:

1. MANGANESE COLLISION LASER p 3-9 refs
2. RARE EARTH COLLISION LASER p 10-15 refs
3. PHOTODISSOCIATION LASERS p 16-26 refs
4. THERMO-OPTICAL EFFECTS IN SOLID-STATE LASER MEDIA p 27
5. LASER PUMPING LASER p 28-33
6. DYNAMIC OPTICAL PATH DISTORTIONS IN LASER RODS S. D. Sims, A. Stein, and C. Roth 16 p (See N66-28554 16-16)
7. END PUMPING OF AN  $\text{R}_1$  RUBY LASER BY AN  $\text{R}_2$  RUBY LASER 7 p (See N66-28555 16-16)

**N66-28554#** TRG, Inc., Melville, N. Y.

**DYNAMIC OPTICAL PATH DISTORTIONS IN LASER RODS**

S. D. Sims, A. Stein, and C. Roth *In its Res. on Properties of Laser Devices* [1965] 16 p (See N66-28553 16-16) CFSTI: HC \$3.00/MF \$0.75  
(Contract Nonr-3833(00))

High quality ruby crystals and improved glass laser materials doped with neodymium were investigated in order to study optical path distortions in laser rods. It was found that significant distortions were introduced as a result of thermal gradient

evolution during the optical pumping cycle. Since laser action occurs only during the pumping pulse, or shortly thereafter in the case of Q-switching, primary emphasis was placed on the time interval of the pumping pulse. Thus a Q-switched laser was found to be a highly effective interferometer illumination source in cases where high time resolution is desired. A side benefit from the use of this technique was that the resulting observations are almost precisely reproducible from shot to shot. Thereafter, it is noted, optical correction can be employed to improve resonator performance at any desired time. This is particularly useful in Q-switching lasers, where the resonator characteristics need only be good during the development of the output pulse. D.T.

**N66-28555#** TRG, Inc., Melville, N. Y.

**END PUMPING OF AN  $\text{R}_1$  RUBY LASER BY AN  $\text{R}_2$  RUBY LASER**

*In its Res. on Properties of Laser Devices* [1965] 7 p (See N66-28553 16-16)

CFSTI: HC \$3.00/MF \$0.75

An analysis and steady state solution are given for a proposed experiment in which an  $\text{R}_2$  ruby laser is to be used to pump an  $\text{R}_1$  ruby laser. This technique is to provide a means for reducing optical path distortions, caused by thermal gradient evolution, by decreasing to a minimum the pump light which must be absorbed. In this case, very little heat deposition is expected. Consequently, it is noted, the radiance of the  $\text{R}_1$  laser should be improved to whatever extent its performance had been limited by thermal effects. D.T.

**N66-28726#** Korad Corp., Santa Monica, Calif.

**GaAs LASER DIODES** Final Report, 1 Jul. 1964-30 Jun. 1965

R. A. Sehr and W. J. Rundle Jan. 1966 28 p refs  
(Contract DA-28-043-AMC-00235(E))  
(AD-478538)

Refinements in the experimental technique for growing p-n junctions from liquid solution resulted in highly uniform and dislocation-free n-layers on p-substrates. High pressure diffused laser diodes were fabricated with thresholds between 50 and 70 amperes at 300°K. and typical power outputs of two watts with 50 nsec pulses and a repetition rate of 1000 pps. Some lasers, mounted on special headers containing a pulse transformer, were operated at 8000 pps with 100 nsec pulses producing a beam of 1.5 watt optical peak power within a beam angle of 12°. Author (TAB)

**N66-28920#** Ballistic Research Labs., Aberdeen Proving Ground, Md. Terminal Ballistics Lab.

**USE OF A LANGMUIR PROBE FOR ELECTRON TEMPERATURE DETERMINATION IN A LASER-INDUCED PLASMA**

William F. Braerman Dec. 1965 49 p refs  
(BRL-MR-1715; AD-631517) CFSTI: HC \$2.00/MF \$0.50

The possibility of using Langmuir probes for electron temperature determination in a laser-induced plasma has been demonstrated. Laser input energies less than 15 joules have been used and electron temperatures on the order of 0.5 ev have been inferred at various distances from the target. The beam was focused to approximately a 1 mm diameter spot. It is shown that the probe current of the start of the pulse follows the laser spiking. Author (TAB)

**N66-28923#** Library of Congress, Washington, D. C. Aerospace Technology Div.

**FOREIGN SCIENCE BULLETIN, VOLUME 2, NUMBER 5** May 1966 58 p refs

## CONTENTS:

1. LASER WITH A NONRESONANT FEEDBACK C. Shishkevich p 1-6 refs (See N66-28924 16-16)
2. GROWTH OF SILICON CARBIDE SINGLE CRYSTALS J. G. Kourilo p 7-15 refs (See N66-28925 16-26)

## SCIENCE &amp; TECHNOLOGY NOTES

- a. OBSERVATIONS OF SKY-ILLUMINATION PHENOMENA FROM SPACESHIPS p 16-19 refs
- b. RT-15 RADIO TELESCOPE p 20-22
- c. THE EFFECT OF NUCLEAR REACTOR RADIATION ON THE OPERATION OF A CESIUM DIODE p 23-27
- d. A 625-KJ CAPACITOR BANK FOR THE PRODUCTION OF HIGH-INTENSITY MAGNETIC FIELDS p 27-29 refs
- e. TRIS(TRIALKYLSTYL) ANTIMONITES p 29-30
- f. POLYMERIZATION OF MONOMERS COMPLEXED AND ORGANIZED ALONG CERTAIN PATTERNS p 31-33 refs
- g. ULTRABASIC ROCKS FROM THE BOTTOM OF THE INDIAN OCEAN p 34-35

## CONFERENCES

- a. SESSION OF THE DEPARTMENT OF GENERAL AND APPLIED PHYSICS OF THE RADIOTECHNICAL INSTITUTE p 36-38
  - b. SEMINAR ON MAGNETIC-TELLURIC METHODS OF STUDYING THE EARTH'S CRUST AND MANTLE p 38-39
3. SCIENCE PERSONALITIES: N. M. EMANUEL' p 40-41
4. BOOK REVIEWS p 42-50 refs

**N66-28924#** Library of Congress, Washington, D. C. Aerospace Technology Div.

**LASER WITH A NONRESONANT FEEDBACK**

Charles Shishkevich *In its Foreign Sci. Bull.*, Vol. 2, No. 5 May 1966 p 1-6 refs (See N66-28924 16-16)

A laser with a nonresonant feedback is described. The active medium consists of two ruby rods, and one or both of the external mirrors of the laser are replaced by a volume or surface scatterer. The only resonant element in the system is the spectral line. The emission of the device is highly monochromatic but is not spatially coherent. It is shown that this system can be used as a frequency standard for the optical part of the spectrum. Author

**N66-29032#** Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.

**MULTIPHOTON PROCESSES BROUGHT ABOUT BY A LASER [PROCESSUS MULTIPHOTONIQUES PROVOQUES PAR UN LASER]**

Pierre Nelson Dec. 1965 24 p refs In FRENCH (CEA-R-2888)

The critical intensity characterizing the multiphoton processes is calculated. The multiphoton effects corresponding to the Compton scattering, the bremsstrahlung, and the photoelectric effect are investigated. The cross sections are evaluated. It is shown how the introduction of a refractive index, in clothing the photons, allows the elimination of the infrared divergence. The theory seems consistent with experiment. Author (NSA)

**N66-29169#** Boeing Scientific Research Labs., Seattle, Wash. Plasma Physics Lab.

**THE FORMATION OF A MAGNETIC PINCH IN InSb AND THE POSSIBILITY OF POPULATION INVERSION IN THE PINCH**

Helmut Schmidt Feb. 1966 41 p refs (DI-82-0502; AD-631711) CFSTI: HC \$2.00/MF \$0.50

A sufficiently strong current supported by an electron-hole plasma in InSb pinches. As the electron-hole gas is compressed by the current's magnetic field, the plasma temperature increases. The strong electron-phonon coupling, however, keeps the plasma temperature below the characteristic temperature of the optical phonons as long as the lattice remains cold. This early period of the pinch, which includes the initial contraction and some 0.0000001 sec thereafter, is discussed. The collapse of the pinch may be halted by an increase of the plasma pressure caused by the exclusion principle or by the occurrence of impact ionization in the pinch's radial Hall field. An estimate of the particle density in the pinch shows that the conditions for population inversion may be satisfied, hence laser action due to stimulated electron-hole recombination might occur. This effect should influence the development of the pinch decisively. Author (TAB)

**N66-29196#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**INFORMATION THEORY AND THE THERMODYNAMICS OF MASERS**

R. S. Ingarden 15 Mar. 1966 57 p refs Transl. into ENGLISH from Postepy Fiz. (Warsaw), v. 15, no. 3, 1964 p 287-322

(FTD-TT-65-899/1+2+3+4; AD-631767) CFSTI: HC \$3.00/MF \$0.50

Contents: Maxwell's 'demon'; Szilard's solution; The concept of information according to Shannon; an axiomatic definition of information; the homogeneous case; the variational principle in generalized thermodynamics; Application in mathematical statistics; The thermodynamics of masers. ('Maser' is used here in the generic 'Molecular amplification by stimulated emission of radiation' sense, not 'Microwave amplification...'). TAB

**N66-29240#** Radio Corp. of America, Princeton, N. J. Astro-Electronics Div.

**CYCLOTRON RESONANCE PUMPING OF GAS LASERS Second Quarterly Progress Report, 1 Sep.-30 Nov. 1965**

S. Ahmed and T. Faith May 1966 31 p refs

(Contract DA-28-043-AMC-01376(E)) (Rept.-2; AD-632100) CFSTI: HC \$2.00/MF \$0.50

Experiments employing combined microwave electron-cyclotron resonance with dc pumping as well as experiments with dc pumping only were performed on argon lasers. Effort was directed towards clearly defining the effects of these pumping combinations on discharge behavior and laser operation. Results of these experiments show that in low-wall-loss magnetically confined dc discharges, the gas pressure is greatly reduced by ion-drift pumping towards the cathode, and laser action takes place at considerably lower pressure than had hitherto been supposed. Microwave cyclotron-resonance pumping was seen to have a significant effect in increasing laser output. This increase in output occurred at high initial gas pressures, and is dependent on the magnetic field being at the resonance value. The laser tested was 40 centimeters long and 8 millimeters in diameter. It was fitted into a tunable microwave cavity within a magnetic solenoid. Measurements were made with both pulse and continuous operation. Author (TAB)

**N66-29246#** Boston Univ., Mass. Dept. of Physics.

**THEORETICAL RESEARCH ON LASER MODELS Final Report, 1 Feb. 1963-31 Mar. 1966**

Charles R. Willis 28 Feb. 1966 15 p refs

(Contract AF 19(628)-2460)

(AFCRL-66-166; AD-632109) CFSTI: HC \$1.60/MF \$0.50

A theory is developed for the description and understanding of laser behavior from a fundamental microscopic point of view. The model consists of N two-level systems interacting with a radiation field. The problems of collective motion, coherence, dissipation and inhomogeneous broadening are treated. This report consists mainly of the abstracts of six papers dealing with these subjects that have or will appear in scientific journals.

Author (TAB)

**N66-29249#** Boston Coll., Chestnut Hill, Mass.

**AN INVESTIGATION OF PROPERTIES OF THE LASER MICROPROBE Final Report (Part I), 1 Jul. 1964-13 Aug. 1965**

James J. Devlin and Anthony B. La Conti 13 Aug. 1965 89 p refs

(Contract AF 19(604)-8819)

(AFCLR-65-855(I); AD-632416) CFSTI: HC \$3.00/MF \$0.75

An investigation of the laser microprobe as a source for emission spectrochemical analysis is reported. The size and character of the crater: burnt into a number of pure element metals was investigated. Working curves for a series of iron and aluminum alloys were produced. This gave a measure of the sensitivity and reproducibility of the laser microprobe.

Author (TAB)

**N66-29428\*#** National Aeronautics and Space Administration, Washington, D. C.

**OPTICAL LOCATION OF THE MOON [OB OPTICHESKOY LOKATSII LUNY]**

A. Z. Grasyuk, V. S. Zuyev, Yu. L. Kokurin, P. G. Kryukov, and V. V. Kurbasov et al May 1964 6 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 154, no. 6, 1964 p 1303-1305 Presented at the Joint Colloq. of the Oscillations Lab. of Quantum Radiophysics, USSR, 28 Sep. 1963 (NASA-TT-F-8866) CFSTI: HC \$1.00/MF \$0.50 CSCL 20E

The preliminary results of locating the moon with the aid of a ruby laser are presented. A schematic representation of the apparatus used is included. A single telescope was used for both transmitting and receiving the light pulses. A preliminary estimate of signal-to-noise ratio was made. The results of measurements made on September 13, 1963 are included. The chosen target was the crater Albategnius on the dark part of the moon. The value of the signal received was four times greater than the root mean square error in measuring the background, and therefore cannot be ascribed to background fluctuations; the measurements permitted reliable registration of signals reflected from the moon.

R.T.K.

**N66-29552#** Joint Publications Research Service, Washington, D. C.

**PROSPECTS FOR LASER AND OPTICAL COMMUNICATIONS**

R. Svoren' 21 Jun. 1966 25 p Transl. into ENGLISH from Nauka i Zhizn' (Moscow), no. 4, Apr. 1966 p 59-65 (JPRS-36111; TT-66-32545) CFSTI: \$1.00

Technological developments and future prospects of lasers and their applications, particularly as radio receivers and transmitters, in optical communications are discussed in a very general way. Among the advantageous characteristics cited for lasers are: (1) The spatial coherence of the laser beam facilitates electromagnetic radiation in only one direction and this property permits a large number of lasers to operate on the same frequency. (2) Lasers generate waves in the optical range of frequencies (infrared, light and ultraviolet), and operate on an unlimited frequency band. (3) The sharp laser beam can be achieved with relatively small emitters, and the ability to emit sinusoidal electromagnetic waves makes it

possible to load the laser beam with information, as in radio transmission. Thus, although utilized to a limited extent now, a single, multi-channel laser beam could carry all television and radio programs, radar signals, remote control, and telemetering. The greatest danger in optical communications is that transmission can vary greatly since the propagation range of a light beam is sharply reduced under unfavorable meteorological conditions; this is considered to be the chief obstacle to constructing an earthbound communications link.

R.L.I.

**N66-29797#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**SOVIET LASERS**

23 Mar. 1966 10 p Transl. into ENGLISH from Wojskowy Przegląd Lotniczy (Warsaw), no. 4, 1965 p 86-87

(FTD-TT-65-1953/1+4; AD-631583) CFSTI: HC \$1.10/MF \$0.50

The following Soviet lasers, presumably on exhibit at the Leipzig fair, are mentioned. A laser with 100-mv power attainable with one hundred millionth part of a second: for detection of cosmic ships in space and for heating plasma. Laser GOR-100, with an unignited light ray that burns holes in steel plates. Razdan laser, operating continuously at 2 light pulses/sec. Laser OK-1, a ruby laser whose thousandth part of a second ray welds the unstuck retina of the eye. SU-1 device that microwelds the parts of precision apparatus that melt with difficulty. The Lucz-3 miniature semi-conductive device that transforms solar light into electricity which in turn is transformed into amplifier laser light. The computer device at Manhasset in New York State computes from meteorological data the best routes for travel between Europe and America.

TAB

**N66-29847#** Naval Air Engineering Center, Philadelphia, Pa. Aeronautical Materials Lab.

**UTILIZATION OF MASER AS A MEANS OF EXCITATION FOR THE SPECTROGRAPHIC EXAMINATION OF MICROSTRUCTURES OF METALS Final Report**

M. D. Smith and J. F. Danovich 31 Dec. 1965 17 p refs (AD-632240) CFSTI: HC \$1.00/MF \$0.50

Investigation of laser as a source of excitation for emission spectroscopy and techniques developed for its use in this capacity are reported. Results of qualitative detection of segregates and inclusions in metallic alloys and the limits of detection of various elements in aluminum standards by the techniques developed are presented in addition to investigations of this means of excitation for the analysis of ceramics and refractories. It is concluded that the results of investigation show the feasibility of the use of the laser microprobe as a means of excitation for emission spectrography. The techniques developed in the analysis of coatings and modifications of the objective lens have increased the versatility and scope of application. Although the laser microprobe offers many advantages over the arc-spark spectrographic source, it nevertheless possesses certain limitations which require that it be considered as a complementary accessory to extend the applications of emission spectroscopy.

Author (TAB)

**N66-29864#** Illinois Univ., Urbana. Electro-Physics Lab.

**GAS LASER STUDIES IN THE 100 to 1000 MICRON RANGE Final Report**

Paul D. Coleman 31 Dec. 1965 11 p refs

(Grant AF-AFOSR-804-65)

(AFOSR-66-0719; AD-632306) CFSTI: HC \$1.00/MF \$0.50

The report summarizes the first year's activities of research on gas lasers in the 100 to 1000 micron range. A general description and experimental results of a water vapor laser covering the 48 to 118 micron range is described. Research

problems to be explored during the second year of the grant are discussed along with a brief comparison with classical electronic methods of generation. Author (TAB)

**N66-29985#** Naval Ordnance Lab., White Oak, Md.  
**SOME EXPLORATORY EXPERIMENTS ON LASER EXPLOSIONS IN PSEUDO-AIR**

Thomas W. Hill and Leonard Rudlin 1 Mar. 1966 31 p refs (NOLTR-65-152; AD-632484) CFSTI: HC \$2.00/MF \$0.50

A Q-switched ruby laser, which cannot explode air directly, has been used to explode various pseudo-air targets. These targets have been, generally, air with increased electron densities, such as a drop of liquid nitrogen or an air-plasma caused by a spark gap. Water drops, to which were added various salts, were also targets in evaluating the feasibility of salting targets. The results consisting of open-shutter photographs, time-integrated spectra, and some photodiode records with micro-second resolution suggest that: (1) twelve spectral lines are found common to nearly all the targets; identification suggests that these lines originate in the air surrounding the targets; (2) the structure of the spectrum resulting from laser interaction with a drop of liquid nitrogen has marked similarity to the structure of lightning spectra; further, most of the twelve lines common to nearly all spectra appear in lightning spectra; (3) the luminous phenomena occur over times like micro seconds from the laser pulses of duration like tens of nanoseconds; and (4) further experiments with nanosecond-to-shake time resolution are needed to clarify the 'explosion' details. Author (TAB)

**N66-29972\*#** ITT Federal Labs., San Fernando, Calif.  
**STUDY OF PROPAGATION OF COHERENT RADIATION AT VISIBLE OR NEAR VISIBLE WAVELENGTHS THROUGH THE ATMOSPHERE** Interim Report, Oct. 1963-Oct. 1964  
 John M. Grant Oct. 1964 59 p refs (Contract NAS8-11103)  
 (NASA-CR-76078) CFSTI: HC \$3.00/MF \$0.50 CSCL 20F

The degree of coherence for optical beams traversing a fluctuating medium is derived in terms of the correlation coefficient of the atmosphere. Under certain specific conditions, it is shown that the degree of coherence is determined solely by one atmospheric parameter, the mean square angular fluctuation of a ray. The degree of coherence of laser beams traversing artificially created fog atmospheres within the ITTFL optical tunnel has been measured by the two-pinhole interferometric technique. The results obtained are in good agreement with the theoretical predictions. Based on this work, the aperture limitation, imposed by the atmosphere, on an optical heterodyne receiver is predicted. Author

**N66-29977\*#** Stanford Research Inst., Menlo Park, Calif.  
**PERFORMANCE SPECIFICATIONS FOR A METEOROLOGICAL SATELLITE LIDAR** Final Report  
 W. E. Evans, E. J. Wiegman, W. Viezee, and M. G. H. Ligda Jun. 1966 190 p refs (Contract NASr-49(22))  
 (NASA-CR-76087) CFSTI: HC \$5.00/MF \$1.25 CSCL 04B

Numerous suggestions have been made regarding measurements of meteorological significance which might be made with a laser radar (lidar) carried in a satellite. In this study a wide variety of possibilities is examined, and it is concluded that the most important thing that can be done with reasonable amounts of power is to provide routine height and density data on cirrus cloud. Cloud-top elevations of lower cloud would also be determined. Calculations, supported by experimental backscatter measurements made with a ground-based pulsed ruby lidar, show that it should be barely possible to measure low-density cirrus cloud at night from a 1000 to 1500 km satellite using a radiated energy of one joule per sounding and a receiving aperture of one square meter. Author

**N66-29984#** Joint Publications Research Service, Washington, D. C.

**COHERENT LIGHT GENERATORS AND AMPLIFIERS**

F. A. Korolev 30 Jun. 1966 30 p Transl. into ENGLISH from Elektrichestvo (Moscow), no. 4, Apr. 1966 p 1-11 (JPRS-36295; TT-66-32727) CFSTI: \$1.00

The most fundamental points connected with quantum generation and light intensification are elucidated. The theory and instrumentation of various coherent light amplifiers are described. The advantages and applications of these lasers are indicated. N.E.N.

**N66-30020#** Lear Siegler, Inc., Santa Monica, Calif. Laser Systems Center.

**SATURABLE FILTER INVESTIGATION** Final Technical Report

L. A. Cross Apr. 1966 53 p (Contract Nonr-4125(00); ARPA Order 306-62; Proj. Defender) (AD-632007) CFSTI: HC \$3.00/MF \$0.50

This report presents the results of the search for suitable saturable filter materials and the theoretical investigation of the saturation effect. The observation of saturation effects in uranyl glass filters is discussed. The effect of a saturable filter in the laser cavity is demonstrated with an experimental Q-switched laser. Author (TAB)

**N66-30157#** Naval Ordnance Lab., Corona, Calif.  
**FOUNDATIONAL RESEARCH PROJECTS** Quarterly Report, Oct.-Dec. 1965  
 1 Mar. 1966 52 p refs (NAVWEPS-8847; AD-630653) CFSTI: HC \$4.60/MF \$0.50

**CONTENTS:**

1. MAGNETO-OPTICAL OBSERVATIONS WITH A TEN-MILLIWATT HELIUM-NEON LASER J. L. Tomlinson p 1-3 refs (See N66-30158 17-16)
2. IMPROVED SYSTEM FOR OBSERVATION OF HIGH-SPEED MAGNETIZATION REVERSAL G. H. Moore p 4-10 refs (See N66-30159 17-23)
3. INFRARED ABSORPTION OF  $\text{Ce}^{3+}$  IN  $\text{LaF}_3$  AND OF  $\text{CeF}_3$  R. A. Buchanan, H. E. Rast, and H. H. Caspers p 11-20 refs (See N66-30160 17-26)
4. SYNTHESIS STUDY OF A CONTINUOUS-SOURCE WAVEGUIDE ANTENNA A. P. Boblett p 21-38 (See N66-30161 17-07)

**N66-30158#** Naval Ordnance Lab., Corona, Calif.  
**MAGNETO-OPTICAL OBSERVATIONS WITH A TEN-MILLIWATT HELIUM-NEON LASER**  
 J. L. Tomlinson In its Foundational Res. Proj. 1 Mar. 1966 p 1-3 refs (See N66-30157 17-23) CFSTI: HC \$4.60/MF \$0.50

Magnetic domain patterns  $1 \text{ cm}^2$  were observed by means of illumination from a 10-milliwatt helium-neon laser. These patterns covered a larger area and showed more contrast than previous domain observation with a lower powered laser. Observations at low speed were more successful than those at high speed. Author

**N66-30173\*#** Northrop Space Labs., Hawthorne, Calif.  
**DEVELOPMENT OF A METEOROID PENETRATION DISTRIBUTED TRANSDUCER** Quarterly Report No. 4, Mar.-May 1966

H. R. F. Novotny Jun. 1966 70 p (Contract NAS8-20194) (NASA-CR-76102; NSL-65-138-4) CFSTI: HC \$3.00/MF \$0.75 CSCL 14B

Hypervelocity impact tests were conducted to evaluate experimental micrometeoroid impact sensors. Photographs illustrate oscilloscope traces of quartz crystal transducer outputs obtained on impacting aluminum target plates with 3.11 mg cylindrical lexan slugs at velocities of 18,000 to 30,000 fps. Stress wave arrival times to the various target points were compared. The lexan projectiles impacted the targets at three different angles: normally to the surface, and at 30° and 60° to the surface normal. Preliminary data analysis indicate: (1) The maximum peak to peak output amplitude is a function of the mass and velocity of the impacted particle, as well as of the distance traveled by the stress wave. (2) Impact location can be calculated from the difference in arrival times of the stress wave. (3) The interfering attenuation factor can be eliminated by comparing amplitudes and arrival times of outputs. (4) Impacting the target surface at oblique angles results in overall decreased output amplitudes. (5) The sensitivity of the sensor-preamplifier combination seemed high enough to detect impacts of projectiles with mass of  $10^{-8}$  g. A brief review is also given of the laser simulation work performed.

L.E.W.

**N66-30264#** Raytheon Co., Waltham, Mass. Research Div.  
**SPECTRAL AND MODE PROPERTIES OF SOLID-STATE LASERS AND OPTICAL DYNAMIC EFFECTS** Final Report, Jan.-Dec. 1965

C. Tang and G. De Mars Jan. 1966 82 p refs

(Contract AF 19(628)-4981)

(S-852; AFCRL-66-202; AD-632566) CFSTI: HC \$3.00/MF \$0.75

Experimental results of a direct measurement of the frequency shift of the output of a single-mode traveling wave ruby laser are reported. A description is included of the preliminary experimental results obtained in a successful attempt at eliminating this frequency shift by introducing a compensating phase shift in the optical cavity with the help of a nitrobenzene Kerr cell. Results of a detailed theoretical study and some preliminary experimental results on the phase locking of modes in solid state lasers are given. These results show the existence of and the reasons for such phase-locking-effect. Results are reported on an attempt at obtaining single-mode operation of the YAG:ND<sup>3+</sup> laser using the scheme suggested by Prokhorov, Burch, and Siegman. The results suggest that it is possible to achieve a single-mode operation with this scheme. Detailed results are given of a theoretical study on the shape of the resonant modes of the Fabry-Perot cavity of an oscillating solid state laser when the nonlinear spatial saturation effect is taken into account. Finally, a report is given of the results of a detailed study on the propagation of an intense light pulse through an optical medium.

TAB

**N66-30291#** Lindo Co., East Chicago, Ind. Crystal Products Dept.

**PRODUCTION ENGINEERING MEASURE FOR RUBY LASER RODS** Quarterly Progress Report, 1 Oct.-31 Dec. 1965

M. K. Towne and B. H. Heise [1966] 20 p refs

(Contract DA-36-039-AMC-06168(E))

(QPR-2; AD-629170) CFSTI: HC \$1.60/MF \$0.50

The document reports progress toward improving the ruby crystal growth process for the manufacture of Range-finder laser rods. Engineering studies during the quarter were concentrated on the effects on individual variables. Definite relations between boule quality and standoff, boule diameters and gas ratios have emerged. Necessity for extended growth runs and repetition of many tests has caused the growth study to slip one and one-half months behind schedule but current use of shorter growth runs and introduction of an

improved feeder six months ahead of schedule will compensate for this slippage. Improved control of the distance between burner and boule cap by an automatic photosensitive device has been extended to both growth stations allocated for contract work. A continuous powder feed has been installed on one station and has operated satisfactorily. Evaluation of boules has been based primarily upon fringe pattern and passive beam divergence. Equipment for active laser testing is not yet available and is cause for a delay in shipment of Engineering Test Samples.

Author (TAB)

**N66-30302#** Texas Univ., Austin.

**RESEARCH ON PLASMA DIAGNOSTIC METHODS FOR HIGH TEMPERATURE PLASMA RESEARCH** Ninth Quarterly Report, 1 Apr.-30 Jun. 1965

Arwin A. Dougal, Robert F. Gribble, Marion O. Hagler, David J. Mayhall, Howard N. Roberts et al Wright-Patterson AFB, Ohio, ARL, Dec. 1965 78 p refs

(Contract AF 33(615)-3224)

(ARL-65-270; AD-631993) CFSTI: HC \$3.00/MF \$0.75

Investigations on the utilization of a HeNe 3.39 micron infrared maser for experimental time-space resolved diagnostics of highly transient, extreme temperature, deuterium plasmas are reported. The infrared maser coupled resonator technique for measurement of electron density was extended such that useful data were obtained for a theta-pinch plasma source operating at 50 Kg compression with 4 and 6 Kg reverse bias magnetic fields at 0.1 Torr initial pressure. Measurement of the magnetoplasma Faraday rotation of the plane of polarization of the He-Ne maser infrared radiation by the use of an infrared polarization analyzer was extended and uncertainties in the measurements were reduced. The determination of electron density provided further information for obtaining time-space resolved plasma magnetic fields from the Faraday rotation data. Resonant operation permits investigation of the low density plasma sheaths surrounding the dense core of the theta-pinch. An equation for the efficiency of a plane echelette diffraction grating is developed from the vector Kirchhoff integral equation for the electric field by making an approximation for the electric and magnetic fields at the surface of the grating.

TAB

**N66-30362#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

**A FOCUS SPOILING RETRODIRECTIVE MODULATOR**

Michael W. Fitzmaurice May 1966 92 p refs

(NASA-TM-X-55539; X-524-66-246) CFSTI: HC \$3.00/MF \$0.75 CSCL 09F

This paper analyzes a semi-passive optical modulator which can be incorporated into a satellite to ground laser communication link or a ground to ground laser link. The system has limited bandwidth capabilities but is useful as a first step in evaluating the utility of lasers in communication through the earth's atmosphere. Modulation is imposed on a reflected beam by varying the optical properties of the retrodirector by a piezoelectric induced displacement. An analysis of the piezoelectric transducer is carried out and equations developed which are used in a typical design procedure. Experimentally, the validity of a geometrical optics approach to the modulation capabilities of the retrodirector is verified. In addition, the need for high speed displacement measurement techniques is noted and two solutions are presented. The first, employing an accelerometer, offers extreme accuracy but relatively narrow frequency response. The second approach utilizes the fringe pattern in a Michelson interferometer and has reduced accuracy but virtually unlimited frequency response.

Author



**N66-30510#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE GaAs SEMICONDUCTOR LASER**

A. Moeschwitzer 24 Nov. 1965 11 p refs Transl. into ENGLISH from Radio und Fernsehen (Germany), no. 16, 1964 p 488-490

(FTD-TT-65-891/1+2+4; AD-624728) CFSTI: HC \$1.00/MF \$0.50

A brief review is presented on the emission process, electromagnetic waves, and emission radiation of a gallium arsenide semiconductor laser. Sketches are included on the band model of a semiconductor, emission process, distribution of the electron concentration on the p-n junction, and recombination radiation along the p-n junction; a semiconductor laser model shows a laser crystal and contact. It is pointed out that laser operation is based on recombination radiation of p-n junctions and that the coherent oscillations are produced over an induced emission radiation, with the aid of a resonator.

R.LI.

**N66-30625#** American Optical Co., Southbridge, Mass. Research Div.

**PREPARATION OF PLATINUM-FREE LASER GLASS**  
**Semiannual Technical Report, 1 Jul.-31 Dec. 1965**

Richard F. Woodcock, George A. Granitsas, and Carl G. Silverberg [1966] 18 p refs

(Contract Nonr-4656(OO); ARPA Order 306-62; Proj. Defender) (SATR-3; AD-632545) CFSTI: HC \$1.00/MF \$0.50

The goal of the investigation is the elimination of platinum particles in laser glass. For glasses melted in platinum crucibles, earlier work indicates that platinum-free glasses may be obtained if the glass is melted in an inert atmosphere. Various methods of homogenizing the glass in an atmosphere furnace, other than stirring, were investigated; including bubbling inert gas through the melt, convection currents and diffusion. A parallel approach to this problem, also being investigated, is the melting of high purity laser glass in an all-ceramic system. Such a system was constructed and tested. Problem areas were identified and design modifications were made where necessary. Optimization of the operational procedure of the furnace is now in progress.

Author (TAB)

**N66-30672#** Sylvania Electric Products, Inc., Mountain View, Calif. Electronic Defense Labs.

**TECHNIQUES FOR SUPER-MODE OSCILLATION** Interim Engineering Report, 1 Dec. 1965-28 Feb. 1966

Russell Targ, B. J. McMurtry, J. M. Yarbrough, and J. M. French [1966] 77 p refs

(Contract AF 33(615)-2884)

(IER-3; AD-633014) CFSTI: HC \$3.00/MF \$0.75

This report describes an experimental and theoretical program to determine the fundamental properties of the FM and super-mode lasers. These two techniques make it possible to obtain at a single frequency the full power of a high-power multimode laser without suffering the loss in power inherent in conventional approaches involving the suppression of modes. The work of this program is divided broadly between two main activities. The first is to obtain a more complete understanding of the physics governing the operation of the FM and super-mode lasers. The second is concerned with improving the techniques for coupling the modes of the FM laser and finding more efficient means for full power super-mode conversion of the FM signal to a monochromatic output.

Author (TAR)

**N66-31142#** Air Force Cambridge Research Labs., Bedford, Mass.

**A LASER FOR AN EARTH-BASED SATELLITE ILLUMINATOR**

Robert L. Iliff Jun. 1965 23 p refs /ts Instrumentation Papers No. 70

(AFCRL-65-442; AD-619342) CFSTI: HC \$2.00/MF \$0.50

A 250-joule, liquid-nitrogen cooled, ruby laser has been used to illuminate a specially equipped satellite, Explorer 22, with sufficient intensity to photograph the cube corner reflectors located on the satellite. The laser system including the photoreceiver is described. A simple method of aligning the optic axis with a known azimuth is presented. Some laser experiments designed to lengthen the lifetime of the laser and to optimize the output energy are also given.

Author (TAB)

**N66-31154\*#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

**ASEE-UNIVERSITY OF MARYLAND-CATHOLIC UNIVERSITY NASA SUMMER FELLOWSHIP PROGRAM** Final Report

Jan. 1966 107 p refs

(NASA-TM-X-55504; X-520-66-3) CFSTI: HC \$4.00/MF \$0.75  
CSCL 09F

**CONTENTS:**

1. DIGITAL FILTER DESIGN W. D. Stanley (Clemson Coll.) p 1-26 refs (See N66-31155 17-07)

2. DESIGN PROBLEMS IN A CONTROL SYSTEM USED FOR PRECISE OPTICAL TRACKING OF SATELLITES AND STARS R. V. Monopoli (Mass. Univ.) p 27-42 refs (See N66-31156 17-07)

3. TRACKING ACCURACY ANALYSIS OF THE 85-FOOT PARABOLIC ANTENNA AT ROSMAN, NORTH CAROLINA C. Ghaznavi (Pratt Inst.) and T. Mercado-Jimenez (Puerto Rico Univ.) p 43-62 refs (See N66-31157 17-07)

4. NOTES ON THE SPIN-HAMILTONIAN H. A. Sabbagh (Rose Polytech. Inst.) p 63-76 refs (See N66-31158 17-26)

5. A PRELIMINARY STUDY OF HOLOGRAPHY L. G. McCracken, Jr. (Lehigh Univ.) p 77-88 refs (See N66-31159 17-23)

6. CORRELATION BETWEEN JITTER AND INFORMATION RECOVERY IN PCM TELEMETERED DATA P. Goodman (Newark Coll. of Eng.) p 89-93 (See N66-31160 17-07)

7. DEVELOPMENT OF THE 10.6-MICRON LASER Z. D. Jastrzebski (Lafayette Coll.) p 95-96 (See N66-31161 17-16)

**N66-31161\*#** Lafayette Coll., Easton, Pa.

**DEVELOPMENT OF THE 10.6-MICRON LASER**

Zbigniew D. Jastrzebski In NASA, Goddard Space Flight Center ASEE-Univ. of Md.-Catholic Univ. NASA Summer Fellowship Program Jan. 1966 p 95-96 (See N66-31154 17-07) CFSTI: HC \$4.00/MF \$0.75

Work was initiated on the development of a 10.6 micron nitrogen-carbon dioxide laser to be used in an optical tracking system for communication between the ground stations and the Echo II satellite. Two experimental setups, which, with respect to the Vycor discharge tube, differed in the mirror arrangement, were designed. In one setup the gold plated mirrors form an integral part of the laser assembly, being vacuum-tight connected to the ends of the discharge tube through metallic bellows. In the second the gold plated mirrors are located externally to the discharge tube, which is terminated by vacuum tight Brewster angle windows. These windows and one of the two gold plated mirrors are made of barium fluoride. This mirror has a one millimeter diameter hole in the gold coating for coupling out the radiation; the other mirror is one hundred percent opaque. The discharge tube is connected through an outlet with the manifold of the vacuum system so that it is possible to control precisely low

partial pressures of the gaseous ingredients. Qualitative measures for the detection of the infrared laser beam were performed. D.T.

**N66-31537#** Westinghouse Electric Corp., Pittsburgh, Pa. Quantum Electronics Dept.

**ARC DISCHARGE SOURCES Semiannual Report, 16 Oct. 1965-15 Apr. 1966**

Charles H. Church, Richard G. Schlecht, I. Liberman, B. W. Swanson, and E. Geil 15 May 1966 92 p refs (Contract Nonr-4647(00); ARPA Order 306-62; Proj. Defender)

(AD-632892) CFSTI: HC \$3.00/MF \$0.75

Research is directed towards explaining quantitatively the pulsed arc xenon discharges used for the optical pumping of high energy lasers. A complete explanation of these discharges requires information on the physical properties of the xenon arc plasma as a function of temperature and pressure. Electrical conductivity of high density xenon plasmas, by R. G. Schlecht, C. H. Church, and I. Liberman. The electrical conductivity of a high density pulsed arc discharge in xenon has been measured. The experimental results agree very well with the Spitzer theory in the region of 1.6 to 2.5 particles per Debye sphere where the Kihara, Aono and Itikawa theory should be much better. Studies of highly radiative plasmas using the wall stabilized pulsed arc discharge, by C. H. Church, R. G. Schlecht, I. Liberman, and B. W. Swanson. Plasmas with pressures exceeding one atmosphere and power densities to 300,000 watts/cu cm have been created in a confined pulsed arc discharge in xenon. Theoretical models for the arc have been studied for the cases for which a major portion of the input power is radiated in the optically thin spectral regions using a homogeneous temperature model. For the optically thick radiation and/or thermal conduction being dominant, techniques for solving integral differential power balance equation are being developed. TAB

**N66-31850#** National Aeronautics and Space Administration. Washington, D. C.

**THE LASER**

[1966] 8 p

(NASA Facts, Vol. III, No. 6) GPO: \$0.10 CSCL 20E

A simple brief discussion of laser technology is presented. Pictures are included to illustrate the various types of lasers and their operation in the areas of space communications, industry, and navigation. Use of lasers for optical radar and space tracking on Explorer satellites is also described. Private industry, medicine, chemistry, and metallurgy are mentioned as potential users of lasers. S.P.

**N66-32075#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

**PULSED-LASER RANGING**

T. S. Johnson *In its* Publ. of Goddard Space Flight Center, 1963, Vol. II [1963] p 876-879 (See N66-32044 18-31) CFSTI: HC \$7.00/MF \$5.00

Pulsed ruby laser signals for satellite tracking were tested by an analog measuring system utilizing a delayed-sweep oscilloscope as the time-measuring device, and also with a digital system employing a high-resolution time-interval unit. Tracking cine-theodolite telescopes with a clear aperture area of about 275 cm<sup>2</sup> were used as receivers, and attenuating filters were installed in the laser transmitter to simulate the reflected signal. Operational tracking tests found the analog measuring system impossible to operate

because of rapid changes in the length of required delay; however, in normal sweep operations, the oscilloscope performed well as a gross monitoring system. The digital system, consisting of a 10-Mc counter with a time-interval unit, a digital clock, and a printout unit performed well but was stopped by backscatter from beam attenuation. G. G.

**N66-32076#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

**THE S-66 LASER TRACKING EXPERIMENT**

H. H. Plotkin *In its* Publ. of Goddard Space Flight Center, 1963, Vol. II [1963] p 880-884 (See N66-32044 18-31) CFSTI: HC \$7.00/MF \$5.00

Presented are numerical calculations for an optical satellite tracking experiment that uses Q-switched rubidium laser signals to illuminate special reflectors attached to satellites, receives the reflected light, measures the time of flight for range, and autotracks the reflected pulse to obtain angle coordination as well. Numerical estimates of expected signal reflections show that a pulse of 1 joule from a ruby laser, attenuated to 0.8 in each passage through the atmosphere, is reflected by a 2000 cm<sup>2</sup> mosaic array of small retroreflectors at a range of 1500 km, within a cone of 10<sup>-4</sup> radian diameter, and can be received in a telescope aperture area of about 500 cm<sup>2</sup>. G. G.

**N66-32219#** Cornell Aeronautical Lab., Inc., Buffalo, N. Y. **INVESTIGATION OF THE LASER-STIMULATED DEPOSITION OF THIN FILMS: PROJECT DEFT Final Report, Feb. 1965-Feb. 1966**

R. J. Clark, Jr. Mar. 1966 50 p refs (UD-2037-E-1; AD-482474)

A study was made of the capability of a ruby laser to cause the evaporation of metals in order to initiate thin-film deposition. It was shown experimentally that a high degree of thermal excitation exists within the laser-generated vapor, which inhibits the coalescence of the vapor on the surface. The amount of energy in the plume has been determined, but the mechanism of its production is unknown. Author (TAB)

**N66-32437#** Carnegie Inst. of Tech., Pittsburgh, Pa.

**A NOTE ON THE THERMODYNAMICS OF LASERS**

R. L. Longini [1964] 12 p refs (Contract NAS8-5269)

(NASA-CR-76761) CFSTI: HC \$1.00/MF \$0.50 CSCL 20E

The suggestion that injection lasers may remove heat from their environment and convert it into light is discussed from the viewpoint of the limits of thermodynamic efficiency which must be achieved before cooling can result. The critical temperatures involved are defined in order to determine how much of the energy of the photon system can be supplied by the phonons. Analytical methods are described, and it is shown that there are equivalent temperatures which can be put into thermodynamic terms of the laser structure and the heat sink. A.O.

**N66-32449#** Los Alamos Scientific Lab., N. Mex.

**DESIGN AND USE OF A HIGH POWER LASER FOR PLASMA GENERATION STUDIES**

Phillip N. Mace 1 Apr. 1966 56 p refs (Contract W-7405-ENG-36)

(LA-3369) CFSTI: HC \$3.00/MF \$0.50

The advent of high power lasers to the technological scene has introduced the possibility of creating new effects utilizing the interaction of this high intensity light with matter. C. M. Fowler and D. B. Thomson of LASL suggested in

1963 the possibility of using a high power laser to pre-ionize and heat a target material to be contained in an explosively driven theta pinch machine. Consequently an effort was undertaken to design and build a suitable laser for some feasibility studies. A 50-MW laboratory laser was built; however, it became possible to use a higher power commercial laser which had the advantage of being more nearly a "tool" rather than a "breadboard" device, and was therefore more amenable to experimental investigation of laser-produced plasmas. This laser was used to produce plasmas in a thin polyethylene target. A two-coil magnetic field system was built to allow the investigation of magnetic containment problems. The following measurements were made: (1) high speed framing camera photographs of the plasma, (2) still 35 mm camera photographs using Kodak X-R type film, (3) spectrographic measurements using a Hilger medium quartz non-time resolved spectrograph, (4) gas laser light absorption measurements, (5) individual spectral line intensity vs time measurements using a Jarrell-Ash monochromator, and (6) ion energies using an optical time-of-flight measuring technique. The results indicate that a plasma having a "temperature" of a few electron volts and a directed energy of several kiloelectron volts is produced by the laser beam. The discrepancy between the thermal energy and the directed energy is attributed to the lack of thermal equilibrium in the plasma. The application of a 20 kilogauss magnetic field increases the apparent "temperature" of the plasma and reduces the directed energy. The feasibility of producing a highly ionized plasma in a moderately low-Z target was demonstrated. Further studies of simpler atomic systems are recommended, particularly in conjunction with more highly refined measurements of plasma temperature, density, and containment effects.

Author (NSA)

**N66-32684\*** Smithsonian Astrophysical Observatory, Cambridge, Mass.

#### **SATELLITE TRACKING WITH A LASER**

C. G. Lehr 20 Jun. 1966 66 p refs

(Grant NSG-87-60)

(NASA-CR-76902; SAO Special Rept.-215) CFSTI: HC \$2.50/MF \$0.75 CSCL 20E

For satellite tracking, laser systems have characteristics that supplement the capabilities of Smithsonian's Baker-Nunn cameras. A laser system can measure range. It can operate when a satellite is in the earth's shadow. It can range on a satellite when the sky is too bright for the Baker-Nunn cameras. The range equation and the statistics of the background noise are used to analyze a laser system. The results are applied to the experimental system now in operation at the Smithsonian astrophysical observing station in New Mexico. Ranging at night and during the day is considered for satellites with retroreflecting mirrors. The laser energy needed to photograph such a satellite in the earth's shadow is computed. Calculations show that the present system can only range on satellites that incorporate retroreflectors; however, commercially available components could be used to build a system that should obtain a return signal from a large noncooperative satellite like Echo 2.

Author

**N66-32699#** Library of Congress, Washington, D. C. Aerospace Technology Div.

#### **FOREIGN SCIENCE BULLETIN, VOLUME 2, NUMBER 6**

Jun. 1966 92 p refs

#### **CONTENTS:**

1. THE POSSIBILITY OF LASER ACTION IN A RAPIDLY COOLED, HIGHLY IONIZED PLASMA C. Shishkevich p 1-19 refs (See N66-32700 19-25)

2. POLYTITANOORGANOSILOXANES AND SOME OTHER METAL-CONTAINING POLYMERS B. Nartsissov p 10-18 refs (See N66-32701 19-06)

3. GROWTH AND FERROELECTRIC PROPERTY OF LITHIUM TANTALATE AND LITHIUM NIOBATE SINGLE CRYSTALS J. G. Kourilo p 19-25 refs (See N66-32702 19-26)

4. SOVIET SCIENTIFIC ACHIEVEMENTS DURING 1965 N. M. Sisaskyan p 26-44

5. REVIEW OF MEDICAL RESEARCH CONDUCTED BY THE SOVIET ANTARCTIC EXPEDITION p 44-50 refs

6. CINEMATOGRAPHY IN SOVIET SPACE TECHNOLOGY p 50-53 ref (See N66-32703 19-14)

7. TWENTY-EIGHTH SESSION OF THE COUNCIL ON SEISMOLOGY p 54-61 ref

8. COMPLEX (MULTI-DISCIPLINE) INVESTIGATIONS OF THE EARTH'S CRUST AND THE UPPER MANTLE p 61-64 ref

9. SESSION ON THE INVESTIGATION OF WIND-PRODUCED WAVES AND THEIR EFFECT ON STRUCTURES p 65-67 ref

**N66-32700#** Library of Congress, Washington, D. C. Aerospace Technology Div.

#### **THE POSSIBILITY OF LASER ACTION IN A RAPIDLY COOLED, HIGHLY IONIZED PLASMA**

Charles Shishkevich *In its Foreign Sci. Bull.*, Vol. 2, No. 6 Jun. 1966 p 1-9 refs (See N66-32699 19-34)

Summary: It is shown that sudden cooling of the free electrons of a highly ionized dense plasma should result in a population inversion in levels near the continuum limit. Recombination of protons and electrons in such a nonequilibrium plasma placed between two mirrors should give rise to stimulated emission on a series of lines in the ultraviolet, visible, and infrared spectral regions. It is estimated that rapid cooling of a hydrogen plasma with an electron concentration between  $10^{14}$  and  $10^{16}$  cm<sup>-3</sup> from an effective temperature of 20,000 to 1000°K during a period of  $10^{-7}$ - $10^{-8}$  sec would be sufficient for laser action. Several methods for attaining such rapid cooling are proposed and analyzed.

Author

**N66-32757\*** Wheeler Labs., Inc., Great Neck, N. Y.

#### **DEVELOPMENT OF OPTICAL WAVEGUIDES AND COMPONENTS Progress Report No. 1339, Feb. 1965-Mar. 1966**

E. Ronald Schineller and Donald W. Wilmot 14 Apr. 1966 113 p refs

(Contract NAS-12-2)

(NASA-CR-76893) CFSTI: HC \$3.00/MF \$0.75 CSCL 20E

Waveguide directional couplers and a waveguide laser are studied for the purpose of developing a large-sized waveguide with components that operate in a single-mode manner. Implementation of slot-type couplers is described and a coupling ranging from 7 to 17 dB is demonstrated. Testing of an evanescent-field coupler is reported. The experimental waveguide laser, which comprises a core of Nd-doped glass and a liquid cladding, is illustrated. Near- and far-field radiation characteristics of the laser, pumped below threshold, indicate an intense directed beam at a wavelength of 1.06 microns caused by directed fluorescence. The feasibility and practicality of all-solid waveguide components is experimentally confirmed.

S.P.

**N66-32847#** Stanford Research Inst., Menlo Park, Calif.

#### **DETECTION OF CEMENT DUST CLOUDS WITH A PULSED RUBY LIDAR, PHASE I**

Myron G. H. Ligda 4 Mar. 1966 21 p

(Contract AT(04-3)-115)

(UCRL-13204) CFSTI: HC \$1.00/MF \$0.50

An experiment conducted at Test Site 300 on 5 February 1966 in which the SRI lidar was used to detect clouds of cement dust dispensed by helicopter was entirely successful. The lidar operated satisfactorily under somewhat adverse weather conditions, the cement clouds were detected well after they had dispersed below visibility (even as viewed against a white cloud background), and the experimental conditions approximated to some degree those that might be encountered at the Nevada Field Site. Based on the signal-to-noise ratios observed at close ranges, if the reactivity of the cement dust clouds approximates that of the dust cloud produced by a nuclear explosion, it should be possible to detect the latter at ranges well over 10 miles with this same equipment. Larger ranges could be expected if the dust cloud contains a higher concentration of particles, larger size particles, and/or some particles of crystalline form such as quartz, mica, or ice, which will produce strong specular reflections. The primary limitation of the lidar is its low firing rate (about 2 per minute, maximum). NSA

**N66-33200#** Joint Publications Research Service, Washington, D. C.

**USSR STUDIES ON HUMAN ACCLIMATIZATION AND OPHTHALMOLOGY**

28 Jun. 1966 18 p. Transl. into ENGLISH from Zdorov'ye (Moscow), no. 4, 1966 p 3-5

(JPRS-36229; TT-66-32662) CFSTI: \$1.00

**CONTENTS:**

1. BIO-MEDICAL PREPARATIONS FOR A MANNED LANDING ON THE MOON p 1-3 (See N66-33201 19-04)
2. ACCLIMATIZATION TO THE FAR NORTH G. M. Danishevskiy p 4-8 (See N66-33202 19-04)
3. LASERS IN OPHTHALMOLOGY L. S. Urmakher p 9-11

**N66-33273#** Yeshiva Univ., New York. Belfer Graduate School of Science.

**LASER PHOTGRAPHY OF JETS, SHOCKS AND PLASMAS Scientific Report No. 1**

Herman M. Presby 1 Apr. 1966 114 p refs

(Contract AF 19(628)-2399)

(AFCLR-66-299; AD-633703) CFSTI: HC \$4.00/MF \$0.75

The phase-contrast microscope of Zernike may be scaled in size and combined with "giant pulse" ruby laser illumination to make possible the observation of macroscopic moving tenuous objects, such as jets, shock waves and plasmas. The resulting instrument, referred to as the Laser Phase Microscope (L.P.M.), has performance similar to that of an optical interferometer operated in the single-fringe mode. The operation of the phase microscope is treated theoretically, first heuristically and then by diffraction integrals. Conditions for optimum imaging are derived. The "phase plate" of Zernike is modified for use with focused laser illumination, and parameters for optimum imaging are given. Quite different mirrors are required for the full range of interesting plasmas accessible to the L.P.M. The experimental model is described. Phasograms of weak and strong shocks in air and argon down to .5 mm Hg pressure are shown. Rayleigh-Taylor instability behind the shock is observed. Gas jets of various refractivities are also used as test objects. Phasograms of vacuum sparks producing jets of ablated electrode material are shown. Many objects studied are invisible to Schlieren photography using the same illumination and optics. Author (TAB)

**N66-33372#** Ohio State Univ., Columbus. Dept. of Physics. **OPTICAL MASER PHOTON RATE GYROSCOPE**

C. V. Heer [1964] 12 p refs Presented at the Symp. on Unconventional Inertial Sensors, Farmingdale, N. Y., 19-20 Oct. 1964

(Grant NsG-552)

(NASA-CR-59820) CFSTI: HC \$1.00/MF \$0.50 CSCL 20E

The basic equations for the resonant frequencies of an electromagnetic cavity in an accelerated system of reference are considered. The removal of the degeneracy between clockwise and counter-clockwise resonant modes in vacuum is discussed in terms of the angular momentum of the photon. If matter with an index of refraction is placed in the cavity the shift in resonant frequency is shown to depend upon the moment of the energy flux. A maser media in the cavity permits oscillation and the beat frequency which is caused by rotation is discussed for a Fabry-Perot square cavity with all flat mirrors and which is oscillating at 3.39 microns. Saturation problems are considered. Author

**N66-33411#** Ohio State Univ., Columbus. Dept. of Physics. **AN EVALUATION OF THE OPTICAL MASER PHOTON RATE GYROSCOPE**

C. V. Heer [1964] 39 p refs Presented at the Colloq. on Advanced Gyroscopes, Paris, 2-6 Nov. 1964; sponsored by the Natl. Center of Spatial Studies

(Grant NsG-552)

(NASA-CR-59809) CFSTI: HC \$2.00/MF \$0.50 CSCL 20E

Calculations for a formal development of the resonant frequencies of an electromagnetic cavity in an accelerated frame of reference are presented to evolve a method of measuring the absolute rotation of a system with electromagnetic radiation. Equations of motion are used for single and degenerate modes and for calculating the polarization of an optical maser medium. The optical maser photon rate gyroscope is evaluated. Schematic designs of the photon rate gyroscope and other typical cavities are given, along with various curves obtained from equations occurring in the series of calculations. L.S.

**N66-33524#** Florence Univ. (Italy).

**A GENERALIZATION OF TANG, STATZ AND DEMARS THEORY OF MULTIMODE OSCILLATION IN A SOLID-STATE LASER Interim Scientific Report No. 2**

L. Ronchi Feb. 1966 32 p refs

(Contract AF 61(052)-871)

(AFCLR-66-384; AD-634913) CFSTI: HC \$2.00/MF \$0.50

The Tang, Statz and Demars theory of multimode oscillations of a solid-state laser, under stationary conditions, is extended to treat the cases of cavities with lossy end mirrors or with frequency-dependent losses. Author (TAB)

**N66-33688#** National Aeronautics and Space Administration, Washington, D. C.

**REVIEW OF THE PRESENT SITUATION ON LASER RESEARCH [ÜBERSICHT ÜBER DIE DERZEITIGE SITUATION AUF DEM LASERGEBIET]**

E. David Jun. 1966 27 p refs Transl. into ENGLISH from Inst. Franco-Allemand de Rech. de Saint-Louis (France), Note Tech. T 21/63, 2 Oct. 1963

(NASA-TT-F-10201) CFSTI: HC \$2.00/MF \$0.50 CSCL 20E

A general review over the papers presented at the 1963 New York Symposium on Optical Masers is given, including theoretical background and future application of lasers. Laser materials, types of lasers (solid-state, gas, semiconductor, etc.), control of laser emission, types of modulation (internal and external), excitation methods, and practical applications are reviewed. The principle of continuous and spike emission is explained, without radically new interpretation. Author

**N66-33813#** General Precision, Inc., Pleasantville, N. Y. Aerospace Group.

**PUMPED TRANSFORMER LASERS Technical Summary Report No. 3, 1 Nov. 1965-1 May 1966**

C. B. Ellis, J. H. Simpson, D. S. Bayley, E. C. Eberlin, and I. A. Greenwood 25 May 1966 84 p refs  
(Contract Nonr-4718(00); ARPA Order 306; Proj. Defender)  
(GPL-A-31-3; AD-633839) CFSTI: HC \$3.00/MF \$0.75

Both experimentation and analysis are underway on the possible use of cesium vapor for a transformer laser to be optically pumped by a battery of Nd glass lasers. A number of important unknown parameters of the  $\text{Cs}_2$  molecule have now been estimated, as a result of a detailed survey of existing data on the other alkali metal molecules. Experimentally, the absorption spectrum of saturated cesium vapor, contained in specially resistant glass at over  $400^\circ\text{C}$ , has been explored throughout the  $1\mu$  region at a dispersion of  $21\text{\AA}/\text{mm}$ . The fluorescent emission of the vapor in this region has also been studied, under irradiation with about  $80\text{ watts}/\text{cm}^2$  of  $1.06\mu$  Nd glass laser light. It seems reasonably clear that  $\text{Cs}_2$  molecules which absorb Nd light are actually raised to the lower vibrational levels of the  $\text{Cs}_2$  an electronic state, as planned. A bleaching of the  $\text{Cs}_2$  absorption transitions at  $1.06\mu$  upon pumping with one Nd glass laser indicates some likelihood that around 50% of the  $\text{Cs}_2$  molecules irradiated are being maintained in this excited state throughout a millisecond pulse. Fluorescence at wavelengths other than pumping wavelength indicates the presence of energy-exchanging molecular collisions, of the general type needed for achieving a high power transformer laser cycle.

Author (TAB)

**N66-33863\*#** National Aeronautics and Space Administration, Electronics Research Center, Cambridge, Mass.

**A NEW CLASS OF TRAPPED LIGHT FILAMENTS**

E. Garmire, R. Y. Chiao, M. A. Johnson, S. Krinsky, H. A. Smith (MIT) et al [1966] 25 p refs  
(Grant NsG-330; Contract AF 19(628)-4011)  
(NASA-TM-X-57831) CFSTI: HC \$1.00/MF \$0.50 CSCL 20E

It is shown that the Raman radiation stimulated by self-trapped filaments of light in intense laser beams is characteristically associated with a new class of filaments of much smaller diameter than the previously identified  $50\mu$ . These new filaments also have different threshold properties, and their characteristics affect substantially the nature of the Stokes and anti-Stokes radiation. A Q-switched ruby laser with a 50 cm cell of carbon disulfide was used, and a beam from a 0.5 mm pinhole provided the exciting light. An Airy disk and an Airy ring of the Fraunhofer diffraction from the pinhole formed the background light. Reflections from a partially reflecting mirror in the laser beam inside a liquid cell were used to show the persistence of these small-scale filaments for many centimeters. The mirror consisted of a dielectrically coated six-micron-thick mylar film. Photomicrographs of the emerging beam were taken and analyzed. The effect of these small-scale trappings on stimulated radiation and on phase velocity, refraction index, acoustic velocity, radiation frequency, and radiation intensity is pointed out in conclusion.

K.W.

**N66-34015#** Bausch and Lomb, Inc., Rochester, N. Y.  
**LASER DAMAGE STUDY OF THIN FILMS Final Technical Report, 1 Apr. 1965-1 Apr. 1966**

J. Becker, W. F. Coombs, and A. F. Turner [1966] 82 p refs  
(Contract Nonr-4717(00); ARPA Order 306)  
(AD-633554) CFSTI: HC \$3.00/MF \$0.75

Damage to optical surfaces and materials is often experienced in high intensity laser beams. The threshold values above which this damage occurs are of interest for both optical engineering and theoretical purposes. In the present work

energy density thresholds were determined for single quarter-wave and halfwave films vacuum evaporated on glass and quartz substrates. Using a  $6\mu\text{sec}$  ruby laser pulse films of the following dielectric materials were studied:  $\text{ThF}_4$ ,  $\text{MgF}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $5\text{NaF}$ ,  $3\text{AlF}_3$ ,  $\text{SiO}_2$ ,  $\text{ZrO}_2$ ,  $\text{TiO}_2$ ,  $\text{CeO}_2$ , and  $\text{ZnS}$ . Aluminum and inconel films were also included. The latter were found to have thresholds around .05 joules/sq cm, whereas thresholds for the dielectrics covered the range from 50 down to 0.5 J/sq cm, roughly in the sequence of the preceding listing.

Author

**N66-34061#** Navy Dept. Washington, D. C.

**DETECTION OF THE RAPID HALATION OF PHOTOIONIZATION AND THE CLOUD OF CONCENTRATED LONG-LIFE IONIZATION RESULTING FROM THE SHOCK WAVE OF A SPARK IN A LASER BEAM [OBNARYZHENIE BYSTROGO OREOLO FOTOIONIZATSII I OBLAKA KONTSENTRIROVANOI DOLGOZHIVUSCHEI IONIZATSII OT UDARNOI VOLNY ISKRY V LUCHE LAZERA]**

G. A. Askar'yan, M. S. Rabinovich, M. M. Savchenko, and A. D. Smirnova [1966] 4 p refs Transl. into ENGLISH from Zh. Eksperim. Teor. Fiz. (Moscow), v. 1, no. 6, 15 Jun. 1965 p 18-23 /ts Transl. No. 2145

(TT-66-61469; AD-634161) CFSTI: HC \$1.00/MF \$0.50

The halation of ionization from photons of a light spark was investigated, using super high frequency radio radiation, for a ruby laser with a Q-factor modulated by the prism rotation. Radiation from the laser was focused with a five cm focal length lens located between the receiving horn with the detector and an antenna generator for eight mm wavelength radio radiation. A long lifetime of the halation plasma on the order of hundreds of microseconds was detected.

D.T.

**N66-34159#** New Mexico State Univ., University Park. Research Center.

**RESONANCE ABSORPTION OF ALPHA-POLARIZED COHERENT RADIATION BY PINK RUBY**

R. C. Mitchell (Ph.D. Thesis) May 1966 90 p refs  
(Contract Nonr-3531(04); Proj. Defender)

(TR-4; AD-633954) CFSTI: HC \$3.00/MF \$0.75

The  $R_1$  absorption doublet in pink ruby has been studied near  $90^\circ\text{K}$ , using alpha-polarized incident radiation with both coherent and incoherent sources. A 2-inch ruby laser was used as the coherent source. Frequency scanning was accomplished by varying the relative temperatures of source and sample. Incoherent light measurements were made with a one-meter Ebert spectrometer using a zirconium-arc source. Careful measurements were made of the wave-length separation of the  $R_1(1/2)$  and  $R_1(3/2)$  components, in the laser source, as well as the separation of the longitudinal modes in each component. The component spacing was found to be  $0.3829 \pm .0004/\text{cm}$  and the mode separation was  $0.0397/\text{cm}$ . The maximum values of absorption coefficient, using white light, were  $10.7/\text{cm}$  for  $R_1(3/2)$  and  $8.8/\text{cm}$  for  $R_1(1/2)$ . Absorption on coefficients corresponding to coincidence of the laser output with the centers of the corresponding lines in the sample varied between 9 and  $3/\text{cm}$  depending on the intensity and degree of plane-polarization of the beam.

Author (TAB)

**N66-34232#** TRW Systems, Redondo Beach, Calif. Quantum Physics Lab.

**HIGH INTENSITY LASER PROPAGATION IN THE ATMOSPHERE Semiannual Technical Summary Report, 1 Nov. 1965-30 Apr. 1966**

Saul Altshuler, Lee M. Frantz, and Theodore D. Holstein 27 May 1966 33 p refs

(Contract N00014-66-C0022; ARPA Order 306; Proj. Defender)

(TRW-4535-6003-RO-000; AD-634316) CFSTI: HC \$2.00/MF \$0.50

Atmospheric heating by laser pulses in transmission windows has been investigated. Arguments are given for reducing previously given estimates for the absorption in the neighborhood of 10.468 $\mu$ A by nearly one order of magnitude. A study has been initiated of an additional heating mechanism not previously considered, namely collision-induced conversion of laser energy into energy of translational molecular motion. A discussion is given of a classical model and of extensions to a quantum mechanical description.

Author (TAB)

**N66-34235#** Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

**DETERMINATION OF THE LOSS PARAMETERS OF A RUBY QUANTUM GENERATOR**

B. I. Stepanov, A. N. Rubinov, and S. A. Mikhnov 16 Mar. 1966 11 p refs Transl. into ENGLISH from Dokl. Akad. Nauk Belorussk. SSR (Minsk), v. 9, no. 6, 1965 p 367-371

(Contract N0w-62-0604-c)

(TR-230-T468; TT-66-61390; AD-633624) CFSTI: HC \$1.00/MF \$0.50

Experimental methods for determining the basic parameters characterizing radiation losses in a ruby laser in a resonator with plane mirrors are outlined, using theoretical concepts developed by the authors in earlier papers. The method is based on determination of the scattering coefficient by measurement of energy level populations during generation. The population of the metastable level, studied with the aid of  $\log(T/T^*) = \alpha_2 \ln(T \text{ and } T^*)$  are transmittances with and without pumping, resp.), indicates that saturation occurs somewhat later than the onset of generation and is independent of the pumping power. The variation in population is attributed to crystal inhomogeneity. Mathematical formulas are given for determining the loss relative to the population and to the transmittance efficiency of the noise radiated by the ruby surface.

Author (TAB)

**N66-34246#** Harry Diamond Labs., Washington, D. C.

**HIGH-CURRENT PULSE GENERATOR FOR GALLIUM ARSENIDE LASER**

William L. Soper Apr. 1966 14 p ref

(HDL-TM-66-3; AD-634507) CFSTI: HC \$1.00/MF \$0.50

A mercury wetted relay pulse generator and a pulse transformer have been built to drive gallium arsenide lasers in a fast pulse mode. The system is capable of 100-A subnanosecond rise-time pulses at 800-Hz repetition rates. The design and performance are discussed.

Author (TAB)

**N66-34267#** Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

**CONSIDERATION OF THE SPLITTING OF THE METASTABLE LEVEL OF A THREE-LEVEL QUANTUM GENERATOR**

B. I. Stepanov and V. P. Gribkovskii 14 Mar. 1966 11 p refs Transl. into ENGLISH from Dokl. Akad. Nauk Belorussk. SSR, v. 7, no. 5, 1963 p 305-308

(Contract N0w-62-0604-c)

(TR-230-T-467; AD-634231)

Previous theoretical studies of a three-level laser have not taken into account the fact that in real materials the metastable level is split. A more rigorous treatment is presented here, considering the ruby laser as a four-level system and using the transition probabilities and particle distribution functions to derive the conditions for steady-state oscillation. Factors favoring transition from one or the other of the two metastable sub-levels to the ground state are examined in detail, and the requirements for establishing oscillation separately at either of the two levels are obtained. If the probabilities of particle redistribution between the components of the metastable level are small as compared to

the probabilities of descent of excited particles into the metastable state, then simultaneous oscillation at both frequencies is possible.

Author (TAB)

**N66-34481#** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

**MEASUREMENT OF THE EXCITED STATE ABSORPTION CROSS SECTION IN RUBY AT 6943 $\text{\AA}$  AND 300 $^{\circ}$ K**

Gerald John Robertello (M.S. Thesis) Mar. 1966 98 p refs (GSP/PH/66-17; AD-633733) CFSTI: HC \$3.00/MF \$0.75

The excited state absorption cross section from the metastable state in ruby at the ruby laser wavelength and at 300 $^{\circ}$ K was experimentally determined. An indirect method was used, which involved the measurement of the times to laser threshold on four high quality ruby rods. A second experiment was then performed to measure the chromium ion population remaining in the ground state at each of these times. The ground state population was obtained by measuring the increase in intensity of 4100 $\text{\AA}$  probe light transmitted through the pumped ruby sample. An upper limit on the value for the cross section was obtained which is in agreement with that obtained by Kiang et. al. of  $0.3 \times 10^{-20} \text{cm}^2$ . However, the conclusion was reached that thermally induced scattering had a small influencing effect, which reduced the final result to an average value of  $0.17 \pm .06 \times 10^{-20} \text{cm}^2$  for the four ruby samples.

Author (TAB)

**N66-34543#** Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

**THEORY OF A CIRCULAR DIELECTRIC RESONATOR**

A. M. Goncharenko and B. A. Sotskii 20 May 1966 9 p refs Transl. into ENGLISH from Dokl. Akad. Nauk Belorussk. SSR, v. 9, no. 4, 1965 p 224-227

(Contract N0w-62-0604-c)

(TG-230-T465; AD-634248) CFSTI: HC \$1.00/MF \$0.50

The properties of finite cylindrical dielectric resonator are discussed. The electromagnetic field of an infinite cylindrical resonator, both in the resonator and in the surrounding medium, is expressed in the form of cylindrical waves satisfying the boundary conditions. The electromagnetic field of a finite cylindrical resonator can be determined only inside the cylinder; the field is expressed as cylindrical waves traveling forward and backward along the cylinder axis. Attempts to use known functions to find the field in the surrounding medium are unsuccessful. But if the field inside the cylinder is known and the continuity of the normal energy flux components across the interface of the media is taken into account, the energy of individual natural oscillations, as well as the losses through the sides and ends of the cylinder, and the total energy stored in the cylinder, can be estimated. General formulas for these quantities have been derived.

Author (TAB)

**N66-34570#** Library of Congress, Washington, D. C. Aerospace Technology Div.

**GROWING YTTRIUM-ALUMINUM GARNET CRYSTALS**

John Kourilo In its Foreign Sci. Bull., Vol. 2, No. 8 Aug. 1966 p 21-25 refs (See N66-34566 20-34)

Soviet achievements during the period 1963-1965 in growing yttrium-aluminum garnet crystals have been reviewed. Different trends were noted in the development of the growth technique from fluxed melts. Major progress was achieved by adding boron oxide to the flux. As a result of this improvement, larger YAG single crystals having an estimated linear dimension of about 2 cm were obtained. Some progress was made in defining the criteria for the growth of quality crystals, although conflicting conclusions were reached by two different teams of Soviet scientists. A comparison was made between Soviet and Western research data.

Author

**N66-34634\*** # Smithsonian Astrophysical Observatory, Cambridge, Mass.

**MEASUREMENTS OF SATELLITE RANGE WITH A RUBY LASER**

C. G. Lehr, L. A. Maestre, and P. H. Anderson 13 May 1966  
38 p refs *Its Spec. Rept.*-211  
(Grant NsG-87-60)

(NASA-CR-77292) CFSTI: HC \$2.00/MF \$0.50 CSCL 20E  
Range measurements on the GEOS-I and BE-C satellites were made with an experimental optical radar located at the Smithsonian astrophysical observing station. The radar's transmitter was a pulsed ruby laser. The receiver incorporated a time-interval counter with an accuracy of  $\pm 10$  nsec, which gives a resolution of  $\pm 1.5$  m. The most distant range measured was 2.6 Mm. The signals returned from the retroreflecting satellites were more than 16 dB below the values predicted by the radar-range equation. The measured ranges were compared with values obtained from orbits computed with field-reduced data of the Baker-Nunn observing stations. The measured and computed ranges were consistent to within a few hundreds of meters, the error that might be expected in the field-reduced orbits. Author

**N66-34712#** Sydney Univ. (Australia). School of Physics.  
**WILLS PLASMA PHYSICS DEPARTMENT Tenth Monthly Progress Report, 1 Jul.-31 Dec. 1965**  
[1965] 8 p  
(NP-15940; PR-10)

Brief comments on research on plasma sources. JXB ionization front studies, compressional wave studies, giant Alfvén waves, microwave interferometry at 2 mm, magneto-Kerr effect, and lasers are included. NSA

**N66-34774#** Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

**DISTRIBUTION OF PUMPING RADIATION DENSITY IN TRIHEDRAL ROD**

F. K. Rutkovskii and T. K. Gur'yanova 20 May 1966 7 p refs  
Transl. into ENGLISH from Dokl. Akad. Nauk Belorussk. SSR, v. 9, No. 6, 1965 p 364-366  
(Contract NOW-62-0604-c)

(TG-230-T476; AD-634245) CFSTI: HC \$1.00/MF \$0.50  
The distribution of pump radiation density in a regular trihedral prism laser resonator is investigated by the methods of geometrical optics, using an expression derived previously for a rectangular prism. The problem of determining the path of a multiply reflected beam is set up geometrically for handling by a computer. Conditions under which the relative pumping density differs from zero are derived in terms of the fresnel reflection coefficients of the rod, and are shown graphically as functions of reflectivity and location within the rod. The pumping density is uniformly distributed for zero reflectivity and decreases toward the center of the rod for finite reflectivity. An expression is given for the ratio of energy absorbed in the rod to incident energy. Author (TAB)

**N66-34783#** Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

**THEORY OF A CIRCULAR DIELECTRIC RESONATOR**

A. M. Goncharenko and B. A. Sotskii 20 May 1966 9 p refs  
Transl. into ENGLISH from Dokl. Akad. Nauk Belorussk. SSR, v. 8, no. 6, 1965 p 360-363  
(Contract NOW-62-0604-c)

(TG-230-T475; AD-634246) CFSTI: HC \$1.00/MF \$0.50

The behavior of a circular dielectric resonator under certain critical operating conditions is discussed. The general expressions for the performance and energy losses of a finite

circular resonator which were derived in part I (AD-634 248) of the article are applied to this case. It is concluded that only lower axial oscillations may occur at threshold pumping levels. At higher pumping levels nonaxial modes may also occur, resulting in a broadening of the beam. Author (TAB)

**N66-34884#** Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

**THE RADIATION POWER OF GAS OPTICAL QUANTUM GENERATORS (LASERS) WITH PLANE MIRRORS AS A FUNCTION OF THE MIRROR MISALIGNMENT ANGLE**

B. I. Stepanov and A. P. Prishivalko 20 May 1966 8 p refs  
Transl. into ENGLISH from Dokl. Akad. Nauk Belorussk. SSR, v. 9, no. 7, 1965 p 432-434

(Contract NOW-62-0604-c)

(TG-230-T474; TT-66-61492; AD-634247) CFSTI: HC \$1.00/MF \$0.50

The problem of field distribution and diffraction losses in resonators with tilted and curved mirrors is treated in the geometrical optics approximation, which has been shown to be valid for consideration of the integrated radiation power. A solution is given for resonators with nonreflecting lateral surfaces, which have properties similar to those of gas lasers. Losses through the lateral surfaces are shown to have a greater effect on the radiation power than diffraction losses. With absolutely plane end plates, the radiation power is extremely sensitive to very slight misalignment; in practice the sensitivity is much lower because of the less than perfect surface quality. The effect of surface quality is considered in terms of a set of concave areas oriented at random small angles and expressions are derived for the radiation power as a function of the surface quality. Agreement with experiment is satisfactory, making the method useful for approximate calculations, if diffraction losses are also considered. Author (TAB)

**N66-35029#** Services Electronics Research Lab., Baldock (England).

**S.E.R.L. TECHNICAL JOURNAL, VOLUME 16, NO. 1**

L. N. Large et al Jul. 1966 31 p refs

CFSTI: HC \$2.00/MF \$0.50

Ion implantation, machining by laser beam, and Gunn diodes are covered in four papers dealing with microelectronics. The doping of semiconductors by ion bombardment is considered in a paper on junction formation in germanium with Sb<sup>+</sup>; and major advantages of the method used are ionic penetration achieved and ability to control the size and position of the treated area. The laser beam machining method makes use of a pulsed high pressure helium-neon laser. Oscillations covering four to 31 Gc/s from a single Gunn diode, which is a solid state microwave generator, are discussed; as is the resonant circuit operation of Gunn diodes. It is shown that the key to understanding the resonant circuit behavior in a Gunn diode lies in the impedance presented at the second harmonic of oscillation. This permits consideration of the device as a self-pumped parametric oscillator, and the subsequent development of useful microwave circuits with an octave continuous tuning range. M.W.R.

**N66-35043#** Istituto Superiore di Sanita, Rome (Italy). Laboratori di Fisica.

**THE SEMINAR AT THE PHYSICS LABORATORY DURING THE PERIOD JANUARY-APRIL 1966 [IL SEMINARIO DEI LABORATORI DI FISICA NEL QUADRIMESTRE GENNAIO-APRILE 1966]**

W. F. Libby et al 4 May 1966 86 p refs in ITALIAN and ENGLISH

(ISS-66/19) CFSTI: HC \$3.00/MF \$0.75

Summaries are presented of lectures given at the Physics Laboratory of the Istituto Superiore di Sanita. Methods, apparatus, and experimental results are given for researches dealing with space chemistry, electron scattering, paramagnetic resonance, particle absorption and diffusion, and laser beams; as well as spontaneous mutations, induced chromosomal breaks, and polyribosomes. The interpretation and experimental verification of the general theory of relativity is also covered.

M.W.R.

**N66-35051#** Kollsman Instrument Corp., Elmhurst, N. Y.  
**LASER APPLICATION AVIATION ORDNANCE STUDY**  
 Mark Steinhacker Port Washington, N. Y., Naval Training Device Center, Mar. 1966 132 p refs  
 (Contract N61339-1867)  
 (NAVTRADEVEN-1867-1; AD-634917) CFSTI: HC \$4.00/MF \$1.00

A laser system applicable to airborne and ground weapon simulation training missions was developed and demonstrated. A full range weapon simulation system was designed in sufficient detail to allow fabrication of a demonstration system. The laser head assembly of this system, which is an yttrium aluminum garnet (YAG) unit operating at 1.065 microns and ten pulses per second continuous, was subjected to complete operational environmental tests. It was demonstrated to be

**N66-35096#** Sylvania Electric Products, Inc., Mountain View, Calif. Electronic Defense Labs.

**TECHNIQUES FOR SUPER-MODE OSCILLATION** Interim Engineering Report, 1 Mar.-31 May 1966  
 Russell Targ [1966] 34 p refs  
 (Contract AF 33(615)-2884)  
 (IER-4; AD-635399) CFSTI: HC \$2.00/MF \$0.50

By means of a frequency selective coupler, more than 50 percent of the multimode power of a He-Ne laser was obtained at a single frequency. The amplitude stability of this single-frequency output was strongly dependent on the behavior of the power stabilization system used to control the positions of the laser mirrors. 28 MW of single-frequency light was obtained from a 50 MW He-Ne laser using the stabilization system described in the previous report. One of the limitations on the use of the super-mode technique is the very high peak-phase deviation ratio ( $I'$ ) that results from the operation of high-power FM lasers. Recently we have been able to operate at FM He-Ne laser with an internal phase perturbation driven at twice the axial mode interval of the laser cavity. The result of this  $2(C/2L)$  excitation is an FM laser with approximately half the usual number of driven modes and thus half the modulation index to be un-modulated by the super-mode modulator. The preliminary design for the control system to absolutely stabilize the frequency of the FM laser has been completed.

TAB

**N66-35122#** North American Aviation, Inc., Downey, Calif. Space and Information Systems Div.

**DESIGN STUDY OF LASER RADAR FOR DETECTION OF CLEAR AIR TURBULENCE** Final Report, 1 Apr. 1965-15 Apr. 1966

Robert C. Breece, David L. Fried, and Raymond A. Munick Jun. 1966 170 p refs  
 (Contract AF 19(628)-5135)  
 (SID-66-450; AFCRL-66-354; AD-634886) CFSTI: HC \$5.00/MF \$1.00

The objective of the research was to perform a design study and feasibility demonstration of a Doppler laser radar system for use in detection of clear air turbulence. Both CW and pulsed radar techniques were investigated to determine

applicability to analysis of laser light backscattered from atmospheric molecules and aerosol particles in order to measure macroscopic motion of the air. It was desired to detect wind gusts in excess of 25 feet per second while operating in a jet aircraft at an altitude of approximately 30,000 feet. The program included analysis of design requirements, analysis of light scattering by the atmosphere, a design trade-off study, and an experimental demonstration. It was concluded that, if particulate matter exists at flight altitudes in sufficient concentration and if advances in the laser state of the art permit fabrication of a laser with the required performance, a system with a range of up to 50 nautical miles is feasible. The analysis showed that the system must depend on scattering from aerosol particles and that a pulsed system has significant advantages over a CW system. A system concept is described which employs detection of beat frequencies in the output current of a photodetector resulting from photo-mixing of the backscattered light from two laser pulses illuminating separated volumes of air. An experimental demonstration was attempted which optically combined the light scattered from two streams of smoke moving at different velocities. The scattering volumes were illuminated by focusing the expanded output beam of an argon laser.

Author (TAB)

**N66-35125#** Hughes Aircraft Co., Culver City, Calif. Aerospace Group.

**DYNAMIC OPTICAL PROPERTIES OF LASER MATERIALS** Final Technical Summary Report

J. W. Carson and L. G. Komai 31 May 1966 42 p refs  
 (Contract Nonr-4878(00); ARPA Order 306; Proj Defender) (P66-134; HAC-A5858; AD-634849) CFSTI: HC \$2.00/MF \$0.50

Dynamic optical distortions were studied in high quality ruby rods (0.05 percent  $\text{Cr}_2\text{O}_3$ ). Radial temperature profiles, determined by non-resonant interferometric techniques, were level to about 5 percent. Radial gain profiles showed variations of 5 percent to 20 percent, depending on the pump energy. A plane polariscope was used to determine the effects of stress birefringence during the pump period. No significant depolarization was observed in ruby during the main part of the pump period, but large birefringence effects were seen in Nd:glass. Thermal changes in length and refractive index were found to be the main source of dynamic optical distortions in ruby. The net effect of these distortions can be made small by use of properly designed cavities.

Author (TAB)

**N66-35171\*#** Perkin-Elmer Corp., Norwalk, Conn. Electro-Optical Div.

**LASER COMMUNICATION SATELLITE EXPERIMENT (LCSE)**

Herbert F. Wischnia 1 Jul. 1966 176 p refs /ts Rept.-8399  
 (Contract NAS8-20115)  
 (NASA-CR-77462) CFSTI: HC \$5.00/MF \$1.25 CSCL 20E

Equipment for the Laser Communication Satellite Experiment (LCSE), and experimental procedures for the experiment are described. Also described are the functions of the LCSE laser/telescope; Apollo Spacecraft modifications for the LCSE; and technical requirements and parameters for components of the LCSE. Calculations of the expected power requirements for the space-to-earth communication link are presented. Information is also given for Ground Station PCM/PL receiver and tracker; and types of data to be developed from the experiment are discussed. The pre-flight, in-flight, and post-flight time requirements allotted the astronauts are outlined, along with a cost and schedule summary. Data tables and curves, and illustrative diagrams relating to the LCSE are included.

L.S.



**N66-35245\*** Perkin-Elmer Corp., Norwalk, Conn. Electro-Optical Div.

**LASER/OPTICS TECHNIQUES Summary Report**

Morley S. Lipsett 29 Apr. 1966 257 p refs *its Eng. Rept.* 8387

(Contract NAS8-20115)

(NASA-CR-77482) CFSTI: HC \$6.00/MF \$1.50 CSCL 20E

Laser and optical techniques applicable to future deep space optical communication systems are discussed. Analysis and laboratory work have been conducted in the following areas: stability of laser beam intensity distribution in the far field; remote boresight alignment of receiving and transmitting optical channels; isolation of the transmitter channel from the receiver channel; determination of a rotational coordinate reference system about the line of sight; and ways of implementing fine guidance tracking and pointing offset capabilities. Laboratory breadboard equipment, which was developed as building blocks, is described, and a summary of project activities to date is presented. Fluctuations in the far field of a He-Ne laser are shown to be of insufficient magnitude to be detrimental to an optical communication link. Further, it is shown that, by special dielectric multilayer filter techniques, channel isolation of at least 115 dB is readily achieved for the purpose of optical duplexing.

Author

**N66-35301#** United Kingdom Atomic Energy Authority, Culham (England). Research Group.

**CO-OPERATIVE SCATTERING OF LASER LIGHT BY A THETATRON PLASMA**

D. E. Evans, M. J. Forrest, and J. Katzenstein Apr. 1966 11 p refs Submitted for Publication

(CLM P-104) CFSTI: HC \$1.00/MF \$0.50

Frequency distributions of ruby laser light scattered on the MAGGI II thetatron plasma have been measured under conditions in which the ratio of correlation length to Debye length,  $\alpha$ , was between 1.2 and 1.5. This regime is important diagnostically because both electron temperature and electron density can be calculated from the shape of the spectrum, without having recourse to a subsidiary Rayleigh scattering experiment.

Author

**N66-35526#** Pennsylvania State Univ., University Park. Dept. of Physics

**[OPTICAL PHENOMENA IN LIQUID AND GASEOUS MEDIA]**

Technical Report, 1 Oct. 1963 - 31 Dec. 1965

D. H. Rank et al [1965] 126 p refs

(Contract Nonr-656(12))

(AD-626808) CFSTI: HC \$4.00/MF \$0.75

**CONTENTS:**

1. ABUNDANCE OF METHANE IN THE EARTH'S ATMOSPHERE U. Fink, D. H. Rank, and T. A. Wiggins 10 p refs (See N66-35527 21-13)

2. INFRARED ABSORPTION SPECTRA OF ISOTOPIC DIMERIC HYDROGEN CHLORIDE MOLECULES D. H. Rank, W. A. Glickman, and T. A. Wiggins 13 p refs (See N66-35528 21-06)

3. BRILLOUIN SPECTRA OF LIQUIDS USING He-Ne LASERS D. H. Rank, E. M. Kiess, U. Fink, and T. A. Wiggins 13 p refs (See N66-35529 21-16)

4. STIMULATED BRILLOUIN SCATTERING IN LIQUIDS A. H. Guenther (AFSC), T. A. Wiggins, R. V. Wick, and D. H. Rank 10 p refs (See N66-35530 21-16)

5. LASER INDUCED BREAKDOWN IN OXYGEN GAS AT HIGH PRESSURE A. H. Guenther (AFSC), T. A. Wiggins, R. V. Wick, and D. H. Rank 15 p refs (See N66-35531 21-16)

6. STIMULATED RAMAN EFFECT IN SOME TETRAHEDRAL MOLECULES D. H. Rank, R. V. Wick, and T. A. Wiggins 12 p refs (See N66-35532 21-23)

7. STIMULATED BRILLOUIN EFFECT IN HIGH PRESSURE GASES A. H. Guenther (AFSC), D. H. Rank, T. A. Wiggins, R. V. Wick, and D. P. Estman 12 p refs (See N66-35533 21-23)

8. BRILLOUIN SPECTRA OF VISCOUS LIQUIDS D. H. Rank, E. M. Kiess, and U. Fink 24 p refs (See N66-35534 21-23)

9. THRESHOLD FOR STIMULATED RAMAN SPECTRA R. V. Wick, T. A. Wiggins, and D. H. Rank 4 p refs (See N66-35535 21-23)

10. CENTER OF DISPERSION FORCES IN HCl INTERACTING WITH RARE GAS ATOMS R. M. Herman 22 p refs (See N66-35536 21-06)

**N66-35529#** Pennsylvania State Univ., University Park. Dept. of Physics.

**BRILLOUIN SPECTRA OF LIQUIDS USING He-Ne LASERS**

D. H. Rank, Edward M. Kiess, Uwe Fink, and T. A. Wiggins *In its Opt. Phenomena in Liquid and Gaseous Media* 13 p. re.s (See N66-35526 21-23) CFSTI: HC \$4.00/MF \$0.75

Brillouin spectra of six liquids, acetone, ethyl alcohol, water, carbon bisulfide, toluene and carbon tetrachloride have been obtained using a He-Ne laser as the light source and employing photoelectric detection. The velocity of sound has been measured with a precision of  $\pm 0.2$  per cent in most cases. The intensities of the central component and the Brillouin components have been measured. Since the liquid samples were prepared so that they were sensibly optically empty, a comparison of the intensities can be made with the theoretical predictions of Landau and Placzek.

Author

**N66-35531#** Pennsylvania State Univ., University Park. Dept. of Physics.

**LASER INDUCED BREAKDOWN IN OXYGEN GAS AT HIGH PRESSURE**

T. A. Wiggins, R. V. Wick, D. H. Rank, and A. H. Guenther (AFSC, Kirtland AFB, N. Mex.) *In its Opt. Phenomena in Liquid and Gaseous Media* [1965] 15 p refs Prepared in Cooperation with AFSC, Kirtland AFB (See N66-35526 21-23) CFSTI: HC \$4.00/MF \$0.75

A ruby laser induced breakdown experiment was performed with oxygen gas at a pressure of 5800 psi. The giant pulse, of about 0.5 joules with a pulse width of 10-15 nanoseconds, caused a breakdown most probably at the focus of the lens. The plasma or the shock wave initiated by the spark presumably spread to the ends of the pressure cell and ignited the neoprene gaskets. The plate glass windows of the cell were badly and deeply crazed on their inner surfaces. A pulse energy of 0.9 joules was measured on the oscilloscope with a half intensity width of about 10 nanoseconds. The fringes appeared to be about 1/3 order wide and showed no resolution of either the Brillouin doublet or the mode structure. The pulse probably contained a single mode and the breadth of the fringes resulted from the stimulated Brillouin effect. As the laser and gas cell were separated by 2 ft, the minimum time between the initial and stimulated laser pulse was 4 nanoseconds. The laser pulse width must have been smaller than the 10 nanoseconds indicated by the oscilloscope. The breakdown was estimated to have occurred at around 75 megawatts. The spectrograph showed that the laser light did not pass through the cell since only an intense continuum was observed. R.N.A.

**N66-35532#** Pennsylvania State Univ., University Park. Dept. of Physics.

**STIMULATED RAMAN EFFECT IN SOME TETRAHEDRAL MOLECULES**

D. H. Rank, R. V. Wick, and T. A. Wiggins *In its Opt. Phenomena in Liquid and Gaseous Media* [1965] 12 p refs (See N66-35526 21-23) CFSTI: HC \$4.00/MF \$0.75

Stimulated Raman spectra have been excited in liquid Sn Cl<sub>4</sub> and in methane gas making use of a medium high power ruby laser. The spectra have been photographed by means of a high resolution grating spectrograph. The  $\Delta\nu$  value  $\approx 1$  for methane was found to be  $2916.605 \text{ cm}^{-1} \pm 0.012 \text{ cm}^{-1}$ . No detectable pressure shift was observed over a range of gas densities from 3 to 12 amagat. The stimulated Raman lines in methane are very sharp and only slightly broader than the laser line. In Sn Cl<sub>4</sub> the first Stokes line consists of only a single component instead of the expected isotopic triplet. The half intensity width of this line was found to be  $0.5 \text{ cm}^{-1}$ . At least  $0.15 \text{ cm}^{-1}$  of this line width must be due to the stimulated Brillouin doublet since the threshold is lower for the stimulated Brillouin effect than for the stimulated Raman effect. The stimulated Brillouin effect was observed with a Fabry Perot etalon. Measurements of the Fabry Perot patterns gave a value of 840 meters per second for the velocity of sound in Sn Cl<sub>4</sub> at 27°C. Author

**N66-35533#** Pennsylvania State Univ., University Park. Dept. of Physics.

**STIMULATED BRILLOUIN EFFECT IN HIGH PRESSURE GASES**

D. H. Rank, T. A. Wiggins, R. V. Wick, D. P. Eastman, and A. H. Guenther (AFSC, Kirtland AFB, N. Mex.) *In its* [Opt. Phenomena in Liquid and Gaseous Media] [1965] 12 p refs Prepared in cooperation with AFSC, Kirtland AFB (See N66-35526 21-23) CFSTI: HC \$4.00/MF \$0.75

Stimulated Brillouin scattering in gaseous nitrogen, methane and carbon dioxide has been observed using a giant pulse laser and employing gas densities from 19 to 385 amagat. Stimulated Brillouin scattering was also observed in carbon dioxide liquid at 26°C and through the transition temperature. The density threshold below which no Brillouin scattering was observed was 56 amagat for nitrogen, 19 amagat for methane, 350 amagat for gaseous carbon dioxide and 385 amagat for liquid carbon dioxide. The velocity of sound in each case increases markedly with increasing pressure. The velocity of sound extrapolated to 1 amagat density for nitrogen and methane agrees sensibly with the isothermal velocity. There is some evidence to indicate an amplitude dependence on the measured velocities. Author

**N66-35535#** Pennsylvania State Univ., University Park. Dept. of Physics.

**THRESHOLD FOR STIMULATED RAMAN SPECTRA**

R. V. Wick, T. A. Wiggins, and D. H. Rank *In its* [Opt. Phenomena in Liquid and Gaseous Media] [1965] 4 p refs (see N66-35526 21-23)

The effect of power and path length on the threshold for stimulated Raman production was investigated. A giant pulse Korad ruby laser system was used, producing an energy of 0.5 joules in 10 nanoseconds in a single mode with a total beam divergence of 6 milliradians. The stimulated Raman spectra of CH<sub>4</sub> and H<sub>2</sub> were observed using 6, 20, and 100 cm length gas cells. The independence of gain with focal length was verified using a 6 cm cell focusing the light in the cell symmetrically with a 5 cm lens and in a 100 cm cell focusing with a 50 cm lens. In both cases the 2nd anti-Stokes lines vanished for absolute pressures less than 55 lbs/sq in. In a 20 cm cell, the pressure threshold for the 1st anti-Stokes line of methane with a 25 cm lens was 70 lbs/sq in. absolute. The pressure threshold for the same cell and power but with a 50 cm lens was calculated to be 170 lbs/sq in. The threshold was found to be 180 lbs/sq in. Using a 50 cm lens, the threshold for an absolute pressure of 715 lbs/sq in. was determined by moving a 6 cm cell along the beam away from the focus until the green anti-Stokes line vanished. The line was not observed for pressures below 260 lbs/sq in. This was verified by observing that the green anti-Stokes line vanished at 215 lbs/sq in. in a 20 cm cell placed 25 cm from the focus of a 50 cm lens. R.N.A.

**N66-35539#** New York Univ., N. Y. Dept. of Meteorology and Oceanography.

**OPTICAL SOUNDING II. PART I: WATER VAPOR STUDIES UTILIZING A THERMALLY TUNED RUBY LASER RADAR**

B. M. Schotland, J. Bradley, and A. Nathan Jun. 1966 24 p refs (Contract DA-36-039-AMC-03411(E)) (TR-66-9; ECOM-03411-F; AD-635301) CFSTI: HC \$1.00/MF \$0.50

Experimental studies have been conducted utilizing a thermally tuned ruby laser radar to study the vertical profile of water vapor systems. Examples of thermal scans of the 6942.16A and 6942.38A water vapor lines are presented. Equipment has been assembled to study at high resolution (0.02/cm) the line shape and strength of these lines. An engineering computation has been made of the temperature distribution within the ruby rod resulting from the energy absorbed from the pumping lamp. Author (TAB)

**N66-35622#** Springfield Armory, Mass.

**DOUBLE PULSE PUMPING OF RUBY LASERS**

Peter Shajenko 8 Apr. 1966 58 p refs (SA-TR20-9301; AD-635065) CFSTI: HC \$3.00/MF \$0.50

Laser performance in double pulse mode of pumping was studied. The xenon flash lamp was energized by two condenser banks discharged in sequence with a time delay between both discharges. Theoretical analysis of discharge characteristics and of experimental data including discharge current, pumping light and laser output at threshold, and higher energy levels in relation to varying time delay are presented. Improvements in overall laser efficiency as much as 12% in double pulse pumping were obtained as compared with conventional single pulse pumping in the experimental setup. The possibility of adjusting the dynamic impedance of the light source and of modifying pumping light pulse for improvement of laser performance is cited. Author (TAB)

**N66-35687\*#** National Aeronautics and Space Administration, Washington, D. C.

**LASERS AND MASERS—A CONTINUING BIBLIOGRAPHY WITH INDEXES, FEBRUARY-APRIL 1966**

Jul. 1966 465 p refs (NASA-SP-7009(01)) CFSTI: HC \$2.50/MF \$2.50 CSCL 20E

Abstracts of reports and articles which appeared during the period February, 1965-April, 1966, in "Scientific and Technical Aerospace Reports", "International Aerospace Abstracts", and "Aerospace Medicine and Biology" are presented. Special attention is given to laser and maser applications as they relate to ranging and communications systems, astronomy and optics, and metalworking. A subject index and a personal author index are included. N.E.N.

**N66-36016#** General Electric Co., Philadelphia, Pa. Missile and Space Div.

**NONLINEAR SCATTERING OF A LASER BEAM FROM A PLASMA**

C. M. Tchen Jul. 1966 31 p refs (R66SD40)

The incoherent scattering is investigated by means of a quasilinear method. First, the stationary spectrum of the scattered radiation, in a collision free plasma without a magnetic field, is studied. Second, the extension of the method to a quasi-stationary plasma determines the decay and growth of the scattered radiation. The Landau damping is found from a simplified basis, and is shown to play an important role in the stationary and non-stationary spectra. Finally, the scattering by plasma instabilities is treated by solving the system of equations governing the growth of the wave and the diffusion of the unstable distribution function of the trapped particles. Author

**N66-36239#** Philco Corp., Blue Bell, Pa. Applied Research Lab.

**STUDY OF LOSS MECHANISMS AND STIMULATED RAMAN EMISSION** Final Technical Report, 1 May-31 Dec. 1965

C. C. Wang Mar. 1966 48 p refs  
(Contract Nonr-4850(00); ARPA Order 306; Proj. Defender)  
(AO56-F; AD-632022) CFSTI: HC \$2.00/MF \$0.50

Extensive measurements were taken on the conversion efficiency and threshold of stimulated raman emission in benzene, nitrobenzene, toluene, and carbon disulfide. It was shown that the self-focusing action of a laser beam is responsible for the onset of stimulated raman emission.

Author (TAB)

**N66-36248#** Texas Univ., Austin. Antennas and Propagation Lab.

**A GIANT-PULSE LASER FOR USE IN AN OPTICAL RADAR SYSTEM**

Kenneth R. Hessel and Alfred H. La Grone 5 Aug. 1966 56 p refs  
(Grant NSF GE-4775)  
(NSF-P-9)

It has recently become possible to build lasers which, when operating in the giant pulse mode, have power outputs in the megawatt range. If operated at a fast pulse rate a giant pulse laser can be used effectively as a transmitter for an optical radar system. Because of the extremely small laser beamwidth and short wavelength the operating characteristics of an optical radar are different from a conventional radar. The laser system considered in this thesis consists in part of a ruby rod in an elliptical cylinder cavity. A xenon flashtube is used to illuminate the ruby. The flashtube and ruby are water cooled and plans are to operate the laser at a pulse rate of one pulse per second. A pulse forming line is used with the flashtube power supply so the current through the flashtube, and therefore the illumination of the ruby rod, is constant over the duration of the flash. A Kerr cell system is used to Q-switch the laser.

Author

**N66-36261\*#** Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.

**SENSING OF METEOROLOGICAL VARIABLES BY LASER PROBE** Semiannual Report, 1 Feb.-31 Jul. 1966

G. Fiocco 1 Aug. 1966 8 p  
(Grants NGR-22-009-131; NGR-22-009-114)  
(NASA-CR-77909) CFSTI: HC \$1.00/MF \$0.50 CSCL 20E

Computer analysis of aerosol density data, obtained by optical radar for heights between 10 km and 30 km, confirmed the existence of a broad aerosol maximum at a height of about 16 km over the North American continent. Correlation of aerosol content fluctuations with various meteorological quantities supported the contention that ozone was rapidly destroyed in the presence of large dust amounts. A preliminary analysis on the problem of determining atmospheric kinetic parameters from the scattering of laser light showed that a transmitted power of  $6 \times 10^5$  watts in a single mode is necessary for an atmospheric probe. Several He-Ne and argon lasers were constructed and are being tested, and a ruby laser was modified for single-mode operation. Also reported are current measurements of the upper atmosphere by optical radar in Norway.

G.G.

**N66-36265\*#** George Washington Univ., Washington, D.C.  
**ORGANIC SYSTEMS INVOLVING TRANSITION METALS FOR OPTICAL LASER MATERIALS** Semiannual Research Report, 1 Nov. 1965-30 Jun. 1966

N. Filipescu 10 Aug. 1966 7 p refs  
(Grant NsG-603)

(NASA-CR-77913) CFSTI: HC \$1.00/MF \$0.50 CSCL 20L

A large number of organic solvent sensitizers and rare earths were evaluated for their maximum fluorescence conditions and the lanthanide ions  $\text{Eu}^{3+}$ ,  $\text{Tb}^{3+}$ ,  $\text{Sm}^{3+}$ , and  $\text{Dy}^{3+}$  evolved as most suitable for sensitization. Quantitative factors studied on the overall energy transfer efficiency were: viscosity, oxygen concentration, excitation wavelengths, and photokinetics. A number of new chromophore-generating compounds and rigid frames were developed for the synthesis of molecular configurations, and a photochemical apparatus was constructed for future evaluation of chemical changes in laser materials. Results on quantum efficiency measurements of europium chelates and europium  $\beta$ -diketonates were published elsewhere.

G.G.

**N66-36291#** Lockheed Missiles and Space Co., Palo Alto, Calif.

**SEMICONDUCTOR GALLIUM ARSENIDE LASER WITH A FLAT RESONATOR**

N. G. Basov, O. V. Bogdankevich, V. A. Goncharov, B. M. Lavrushin, and V. Iu. Sudzilovskii [1966] 8 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 168, no. 6, 1966 p 1283-1286

Total generation power of optical radiation in a semiconductor laser is discussed in relation to a system with a flat cavity. The experimental setup, consisting of an n-type GaAs sample, is illustrated. Spectral distribution of the intensity of spontaneous and forced radiation of GaAs at 300°K is presented. To determine the losses in the inactive domain and to estimate the maximum gain coefficient at the generation wavelength, the transmission spectra of a GaAs plate in the same geometry as in the generation regime were measured. The dependence of the absorption coefficient on the wavelength obtained from an analysis of the transmission spectra is presented. Estimates of the minimum gain required for generation exceeded by almost an order of magnitude of the value of the absorption coefficient at the generation wavelength. It is stated that this contradiction may be associated with contraction of the forbidden band of the excited crystal.

S.P.

**N66-36387\*#** Varian Associates, Beverly, Mass. Quantum Electronics Div.

**RESEARCH LEADING TO PRACTICAL RUBIDIUM MASER OSCILLATORS** Final Report

8 Mar. 1966 17 p  
(Contract NAS5-9607)

(NASA-CR-77924) CFSTI: HC \$1.00/MF \$0.50 CSCL 20E

It is reported that a laboratory which is equipped with two cell filling systems was set up and deals with problems related to optical pumping in rubidium. A theory describing the operation of the rubidium maser and the conditions for oscillation is summarized, and gives approximately the behavior of the maser as a function of light intensity and rubidium density. This theory shows that a limited exists in the power available out of the maser due to non-uniform illumination of the maser cell. Experimentally, a maser was built using the cell type approach and construction of a second maser was initiated.

C.T.C.

**N66-36419#** Boeing Scientific Research Labs., Seattle, Wash.  
**PLASMA PHYSICS LABORATORY REVIEW, JANUARY-JUNE 1966**

James E. Drummond et al [1966] 30 p refs  
Details are given on the use of a two-component laser interferometer to measure the strain rate at the Kern River fault. With this instrument, velocity gradients in the earth were measured

on a daily basis with  $10^4$  times greater sensitivity than possible before. Other continuing research in various phases of plasma physics is summarized. Topics pursued in plasmas in solids include fundamental property measurements, microwave radiation, pinch effect, and plasma density probe. Also discussed are plasma diffusion studies, oscillation theory for plasma in semiconductors, laser production of plasmas, onset of turbulence in the positive column, Alfvén waves in relativistic waves, plasma radiation from silver foils, diffusion of a magnetically pumped plasma, and high frequency field penetration.

L.E.W.

**N66-36420\*** National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.

**MANUFACTURING RESEARCH AT MSFS Research Achievements Review Series No. 8**

1965 43 p

(NASA-TM-X-53505) CFSTI: HC \$2.00/MF \$0.50 CSCL 13H

## CONTENTS:

1. INTRODUCTION TO MANUFACTURING RESEARCH AT MARSHALL SPACE FLIGHT CENTER H. F. Wuenschel p 1-2
2. MANUFACTURING RESEARCH IN SUPPORT OF SATURN V J. R. Williams p 3-14 (See N66-36421 21-31)
3. ESTABLISHING A COMMON DENOMINATOR IN WELDING G. Parks p 15-20 (See N66-36422 21-15)
4. RESEARCH IN SUPER POWER LASERS AND INTENSE MAGNETIC FIELDS R. J. Schwinghamer p 21-30 (See N66-36423 21-16)

**N66-36423\*** National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.

**RESEARCH IN SUPER POWER LASERS AND INTENSE MAGNETIC FIELDS**

R. J. Schwinghamer *In its* Mfg. Res. at MSFC 1965 p 21-30 (See N66-36420 21-34) CFSTI: HC \$2.00/MF \$0.50

Superpower lasers were investigated for use in drilling and welding procedures. After pink and red ruby and glass lasers were studied, it was concluded that the most promising was the pink laser in a coaxial gun with a Cassegrainian focusing system, an input power of 240,000 J, and an output power of 2000 J. It has a high thermal conductivity; its emission wavelength is suitable for welding as it is characterized by less reflection and more absorption; life of the crystal still is better because it does not craze or solarize easily; and the unfocused beam spread is very small. Research developments in application of intense transient magnetic fields to various manufacturing problems are also reported. An electromagnetic constriction technique, employing high intensity pulsed fields, was used to correct oversized metal tunnels (e.g., Saturn V LOX). Pneumatically clamped and hand-held magnetomotive hammers were developed to remove weld distortions from Saturn V heavy skin sections, gore segments, and bulkheads. Progress on other magnetic field tools for manufacturing processes such as fastening, swaging, blanking, sizing and coining is also reported.

L.E.W.

**N66-36554\*** Sylvania Electric Products, Inc., Waltham, Mass. Applied Research Lab.

**PRECISION AUTOMATIC TRACKING USING A CW LASER**

E. L. Mc Gann *In* Canaveral Council of Tech. Soc. 3d Space Congr. 1966 p 583-597 refs (See N66-36506 22-30)

The design and performance of a precision CW laser tracker are described. Its tracking accuracy against low acceleration targets is comparable to the accuracy of a star tracker, however, the laser tracker has the added capability of measuring range to the target. The main components in this tracking system are a servo-controlled flat mirror, a large aperture

parabolic mirror, an image dissector, and manual control facilities. The laser source is a 10 milliwatt He-Ne gas laser. The instrument was used to track a retroreflector carried by a light airplane, a small rocket covered with Scotchlite retro-reflective material, the Echo I satellite, and a +7.5 visual magnitude star. The characteristics of the tracker performance revealed by these tests are cited.

H.S.W.

**N66-36868#** Illinois Univ., Urbana. Dept. of Electrical Engineering.

**JUNCTION EFFECTS IN COMPOUND SEMICONDUCTORS**

N. Holonyak, Jr., M. D. Sirkis, C. J. Nuese, J. S. Moore, and G. Stillman Feb. 1966 12 p refs

(Contract AF 19(628)-4337)

(AFCRL-66-245; AD-635620) CFSTI: HC \$1.00/MF \$0.50

The current state of progress in the synthesis, junction fabrication, and lamp and laser operation of  $\text{Ga}(\text{As}_{1-x}\text{P}_x)$  is described. The effect of the considerable depth of donor states near the indirect  $<100>$  conduction band minimum is shown to reduce the high-energy limit (reduces  $x$ ) of laser operation in  $\text{Ga}(\text{As}_{1-x}\text{P}_x)$ . Silicon p-i-n deep-level oscillators are described that operate beyond 100 MHz under dc bias.

Author (TAB)

**N66-36881#** Joint Inst. For Lab. Astrophysics, Boulder, Colo. **PROPOSAL FOR AN INVESTIGATION OF HIGHLY EXCITED STATES IN A DISCHARGE BY MEANS OF A TUNABLE LASER BEAM**

B. Brehm *In its* The Lowering of the Ionization Potential and Related Probl. of the Equilibrium Plasma 15 Jul. 1966 p 189-191 refs (See N66-36869 22-25)

As the energy range over which a laser can be tuned is very small, modulation by microwaves is considered to offer the most promising approach. It is pointed out that the limited size of the tuning range makes it necessary to match the laser transition to the discharge material. Assuming that a shift of  $10^{-4}\text{eV}$  can be accomplished, the published gas laser lines were compared with atomic transitions. Three cases are proposed for investigating the influence of fields on highly excited states of atoms. It is expected that new laser lines will increase the number of atoms which can be excited to states close to their ionization limit.

M.G.J.

**N66-36913#** Advanced Kinetics, Inc., Costa Mesa, Calif.

**STUDIES ON THE INTERACTION OF LIGHT AND PARTICLE BEAMS**

R. W. Waniek et al 15 Mar. 1966 37 p refs

(Contract AF 49(638)-1359)

(AFOSR-66-1090; AD-635016) CFSTI: HC \$2.00/MF \$0.50

## CONTENTS:

1. SUMMARY OF RESEARCH ACTIVITIES 3 p
2. FARADAY ROTATORS FOR HIGH POWER LASER CAVITIES R. W. Waniek and N. George (Calif. Inst. of Tech.) 12 p refs (See N66-36914 22-16)
3. THE INTERACTION OF MACROSCOPIC PARTICLES WITH COHERENT LIGHT BEAMS 16 p refs (See N66-36915 22-16)

**N66-36914#** Advanced Kinetics, Inc., Costa Mesa, Calif.

**FARADAY ROTATORS FOR HIGH POWER LASER CAVITIES**

R. W. Waniek and Nicholas George (Calif. Inst. of Tech.) *In its* Studies on the Interaction of Light and Particle Beams 15 Mar. 1966 12 p refs (See N66-36913 22-16) CFSTI: HC \$2.00/MF \$0.50

The large values of Faraday rotation obtained with the use of pulsed high field magnets are shown to be applicable

to the control of laser cavities. Experiments are described in which high field magnets are operated up to 400 k Ce to introduce large rotations in short highly transparent optical media. With a ruby laser, interesting pulse enhancement and periodic equispaced output is observed and related to the switching rate of the field, typically 20 k Oe/ $\mu$ sec. Used with a crypto-cyanine shutter, it is found that either a single giant pulse or a well-spaced series of pulses can be obtained. These are synchronized with respect to the varying magnetic field with fractional microsecond accuracy. Author

**N66-36915#** Advanced Kinetics, Inc., Costa Mesa, Calif.  
**THE INTERACTION OF MACROSCOPIC PARTICLES WITH COHERENT LIGHT BEAMS**

*In its* Studies on the Interaction of Light and Particle Beams  
 15 Mar. 1966 16 p refs (See N66-36914 22-16) CFSTI: HC \$2.00/MF \$0.50

The apparatus, theory, and procedures used to study the generation and impingement of a laser beam against a suspended population of macroscopic particles are discussed in detail. By means of specially shaped quadrupole fields, aluminum microspheres of 20 $\mu$  diameter were injected and supported in a given volume for reasonable lengths of time. The interaction was detected in a drift tube where pick-up electrodes determined velocity and acceleration. The effect of localized evaporation induced in minute particles by an impinging beam of coherent light was calculated. The expected recoil velocities generated by the beam pressure compounded by the evaporation process were determined and the acceleration of the macroscopic particles was evaluated for a given duration of the vaporization process. Terminal velocities in excess of 10<sup>5</sup> cm/sec could be expected for masses of the order of 10<sup>-11</sup> grams, or more, and diameters of the order of 10 to 100 $\mu$  with energy densities in the field of a few joules/cm<sup>3</sup>. L.E.W.

**N66-37071#** Applied Physics Lab., Johns Hopkins Univ. Silver Spring, Md.

**ON THE DIFFRACTION OF PARTIALLY COHERENT LIGHT**

B. A. Sotskii and A. M. Goncharenko 23 Jun. 1966 10 p refs  
 Transl. into ENGLISH from Dokl. Akad. Nauk Belorussk. SSR, v. 8, no. 7, 1964 p 438-440

(Contract NOW-62-0604-c)  
 (TG-230-T478; TT-66-61806; AD-635879) CFSTI: HC \$1.00/MF \$0.50

The diffraction of partially coherent light at a narrow slit is calculated for a given coherence function satisfying the wave equation at all points. It is shown that the divergence angle depends only on the wavelength and the coherence interval but not on the diameter of the end face. Since the divergence angle and coherence interval are uniquely related, and each can be obtained independently, a direct experimental check of the relation between the two is possible. Applicability of the results to describe the radiation from a dielectric resonator, e.g., a ruby laser, is discussed. Author (TAB)

**N66-37072#** Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

**THE OUTPUT POWER AND DURATION OF GENERATION OF A RUBY OPTICAL QUANTUM GENERATOR AS A FUNCTION OF THE PUMPING**

R. I. Gintoft and A. M. Sarzhevskii 21 Jun. 1966 9 p ref  
 Transl. into ENGLISH from Dokl. Akad. Nauk Belorussk. SSR, v. 9, no. 9, 1965 p 578-580

(Contract NOW-62-0604-c)  
 (TG-230-T479; TT-66-61808; AD-635889) CFSTI: HC \$1.00/MF \$0.50

The conditions required to obtain maximum output from a ruby laser as a function of pumping conditions was investigated experimentally for several values of the interferometer base. At minimum distance, the output increases with increased pumping, but at greater distances the output levels off and at still greater distances, it undergoes a maximum, all at the same pumping power. A mechanism is proposed to account for these effects. Author (TAB)

**N66-37178#** Hughes Research Labs., Malibu, Calif.  
**HIGH POWERED DIFFRACTION LIMITED RAMAN LASER**  
**Final Report, 15 May 1965-14 Apr. 1966**

F. J. McClung, D. H. Close, R. W. Hellwarth, and W. G. Wagner  
 May 1966 65 p refs  
 (Contract Nonr-4849(00); ARPA Order 306; Proj. Defender)  
 (AD-636250) CFSTI: HC \$3.00/MF \$0.75

Problems associated with the realization of a high energy, highly coherent Raman laser have been investigated. Since the discovery that the self-focusing of pump radiation and scattered radiation is present in most laboratory Raman lasers and tends to spoil the coherence of the output, the nature and mechanisms of this self-trapping have been the primary objects of study in order that it might be prevented. Time resolved photographic studies have been made which show that the small filaments of self-trapped light in the pump beam persist for only a small fraction of the beam pulse duration and are sufficiently intense to resolve the apparent discrepancy between the average intensity and observed Raman gains. Time integrated photographic studies and photometric studies showed that only purely linearly polarized light preserves its polarization after self-trapping in CS<sub>2</sub> and nitrobenzene. Attempts to compare measured nonlinear indices for both circular and linear polarizations with those calculated for various mechanisms were frustrated by this instability in the propagation of circularly polarized light. The instability was explained qualitatively and indicates that electrostriction is not a dominant mechanism. A classical statistical mechanical calculation of the nonlinear index of a liquid (with no macroscopic density changes) showed that the local redistribution of molecules is generally important. This effect will cause perfectly symmetric molecules to have a significant nonlinear index. Author (TAB)

**N66-37256#** Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

**CALCULATION OF A LASER MONOPULSE DURING INSTANTANEOUS SWITCH-IN OF AN INTERFEROMETER**

A. M. Samson and V. A. Savva 17 Jun. 1966 12 p refs  
 Transl. into ENGLISH from Dokl. Akad. Nauk Belorussk. SSR, v. 9, no. 1, 1965 p 22-26

(Contract NOW-62-0604-c)  
 (TG-230-T473; TT-66-61809; AD-635890) CFSTI: HC \$1.00/MF \$0.50

Formulas are derived for analyzing the basic characteristics of a single-pulse Q-switching laser as functions of population inversion, pumping power, mirror reflectivity, and other properties of the active medium and resonator. Calculations based on these formulas show good agreement with computations made on a digital computer in two previous works by the authors. The limits of applicability of the formulas are discussed. Author (TAB)

**N66-37453#** Stanford Univ., Calif. Microwave Lab.

**MICROWAVE RESEARCH Quarterly Status Report No. 28, 1 Nov. 1965-31 Jan. 1966**

M. Chodorow et al Apr. 1966 18 p refs  
 (ML-1424; AD-636090) CFSTI: HC \$1.00/MF \$0.50

Contents: Acoustic wave amplification studies, optical maser research, tunable lasers, geometrical optics of acoustic waves, oscillations in semiconductors, theory of nonuniform plasmas, bulk instabilities in ferromagnetic metals. TAB

**N66-37709#** Joint Publications Research Service, Washington, D. C.

**TWENTY-SECOND ALL-UNION SCIENTIFIC SESSION DEVOTED TO RADIO DAY. Section on Quantum Electronics**  
A. L. Mikaelyan, ed. 19 Aug. 1966 95 p refs Transl. into ENGLISH of the Publ. "XXII VSESOYUZNAYA Nauchn. Sessiya, Posvyashchennaya dnyu Radio, Sekts. Kvantovoy Elektron." (Moscow), 1966 p 1-101

(JPRS-37132; TT-66-3356) CFSTI: \$3.00

Experimental investigations theoretical designs and analyses, and characteristics are among the data presented on such aspects of quantum electronics as ruby lasers, optical generators, optical gates, pulse-modulated photon communication channels, waveguides, electromagnetic wave propagation, and threshold communication systems. For individual documents see N66-37710-N66-37729. M.G.J.

**N66-37710#** Joint Publications Research Service, Washington, D. C.

**BIOLOGICAL EFFECT AND DOSIMETRY OF RADIATION OF RUBY LASER**

A. A. Gorodetskiy, B. R. Kirichinskiy, I. R. Yevdokimov, and V. M. Kolesnik *In its Twenty-Second All-Union Sci. Session Devoted to Radio Day. Sect. on Quantum Electron* 19 Aug. 1966 p 1-2 (See N66-37709 23-10) CFSTI: \$3.00

Calorimetric, chemical, and photographic methods were used to measure the absorbed radiation energy of a ruby laser by various tissues (blood, blood plasma, skin, muscle, organs, organisms, and biological media). The effect of dye coloring on the extent of the absorbed energy of the radiation was also studied. The elastic (ultrasonic) oscillations that take place when laser radiations act upon solid bodies, liquids, and different biological media, were investigated by means of a piezoelectric pickup. The ultrasonic pulses had a duration somewhat longer than the duration of the laser pulse. L.S.

**N66-37711#** Joint Publications Research Service, Washington, D. C.

**CALCULATION AND EXPERIMENTAL INVESTIGATIONS OF OPTIMUM OPERATING CONDITIONS OF RUBY GENERATOR WITH PASSIVE SHUTTER**

V. Ya. Anton'yants and V. A. Dolgiy *In its Twenty-Second All-Union Sci. Session Devoted to Radio Day. Sect. on Quantum Electron* 19 Aug. 1966 p 3-6 (See N66-37709 23-10) CFSTI: \$3.00

The optimum operating conditions of 8- and 12-cm long ruby lasers (6.5 mm diam) were experimentally determined. A cell with a solution of phthalocyanin in chloroform served as the passive shutter. Plots showing the relationships between the pumping energy, and the transmission factor of the output mirror are given. The experimental results were compared with results calculated for a quanta-generator with a passive shutter described in the literature. A schematic drawing of this generator is depicted, along with curves showing the relationships between the duration of pumping pulse, transmission, and energy of the pumping for the generator. The theoretical and experimental investigations show that the duration of the radiation pulse depends to a large degree on the size of the resonator and on the transmission ability of the passive shutter. It is practically independent of the transmission factor of the output mirror and of the length of the ruby crystal. L.S.

**N66-37712#** Joint Publications Research Service, Washington, D. C.

**ENERGY-METHODS FOR INVESTIGATING THE CHARACTERISTICS OF RUBY CRYSTALS FOR OPTICAL GENERATORS**

V. V. D'yachenko and V. A. Chaplygin *In its Twenty-Second All-Union Sci. Session Devoted to Radio Day. Sect. on Quantum Electron* 19 Aug. 1966 p 7-11 (See N66-37709 23-10) CFSTI: \$3.00

A simple method of finding the concentration of chromium ions of a ruby crystal from the output characteristics of the radiation is described. The value of the gain factor per unit of length was determined from the relative change in the threshold generation for various values of the coefficient of reflection of the output mirror, and curves showing the relationship are depicted. The chromium concentration data were compared with results obtained by chemical analysis. Another method for measuring the effective lifetime under generation conditions based on the relationship between the feeding threshold energy and the duration of the feeding pulse, is also described. In addition, mathematical formulas for expressing the output radiation energy are derived which are useful for measuring losses in ruby crystals. L.S.

**N66-37713#** Joint Publications Research Service, Washington, D. C.

**INVESTIGATION AND DESIGN OF OPTICAL PULSE GENERATORS**

V. M. Gardash'yan, V. V. D'yachenko, and Yu. V. Libin *In its Twenty-Second All-Union Sci. Session Devoted to Radio Day. Sect. on Quantum Electron* 19 Aug. 1966 p 12-14 (See N66-37709 23-10) CFSTI: \$3.00

The effect of flux velocity on the temperature inside a ruby crystal was investigated by means of a method employing a thermocouple inserted into a hole drilled into a generator in which the ruby is placed. The relationship was of a nonlinear character. With large increases of flux velocity, the cooling effectiveness remains almost unchanged. The efficiency of the generator can be increased by increasing the pumping power, but will overheat the crystal with a pumping energy larger than k-joules. Other factors, such as the optimum crystal diameter, crystal quality, uniform distribution of chromium in the crystal, for designing an optimum pulse generator are also discussed. L.S.

**N66-37870#** Osaka Univ. (Japan). Dept. of Electrical Engineering.

**LASER INDUCED PHOTOCONDUCTIVITY IN CADMIUM SULFIDE SINGLE CRYSTALS**

Katsumi Yoshino, Yasutaka Watanabe, and Yoshio Inuishi *In its Technol. Rept. of the Osaka Univ.* Vol. 16 Oct. 1965 p 227-231 refs (See N66-37866 23-34) CFSTI: HC \$6.00/MF \$1.50 (Rept.-661)

Photoconduction in CdS was observed with the laser light and compared with those observed with tungsten light excitation. The photocurrent follows  $I^{2.2 \pm 0.2}$  dependence on the laser light intensity, whereas it follows  $I^{0.8 \pm 0.2}$  for the ordinary green light. This indicates that an electron was excited from the valence band to the conduction band with the simultaneous absorption of two photons. The temperature dependence of the photocurrents has nearly the same tendency for both incident lights. The absorption coefficient was slightly larger for P//C than for P⊥C, where P and C are the direction of polarization and the C-axis of the crystal respectively. Author

**N66-37871#** Osaka Univ. (Japan). Dept. of Electrical Engineering.

**INTERACTION OF THE LASER BEAM WITH GASEOUS MATTERS**

Chiyoe Yamanaka, Masahiro Yokoyama, Sadao Nakai, Tatsuhiko Yamanaka, and Yasukazu Izawa *In its Technol. Rept. of the Osaka Univ.*, Vol. 16 Oct. 1965 p 233-250 refs (See N66-37866 23-34)

(Rept.-662) CFSTI: HC \$6.00/MF \$1.50

The interactions of the laser beam with gaseous matters are reported. They are divided into three categories. One is the scattering of laser beam by the matters which is applied to the plasma diagnostics and also to the upper atmospheric experiments. The second is the laser interferometry which is a very capable method to measure the gaseous matters. The last one is a nonlinear effect of gases caused by the heavy intense laser light. Some experimental results and schemes are presented. Author

**N66-38178#** Army Electronics Labs., Fort Monmouth, N. J. **ATOMIC BEAM PREPARATION TECHNIQUES FOR HYDROGEN MASER OPERATION WITH UNPOLARIZED ATOMS** Harro G. Andresen, Edward Pannaci, and John F. Fulton Jun. 1966 36 p refs

(ECOM-2720; AD-636582) CFSTI: HC \$2.00/MF \$0.50

Hydrogen maser operation with unpolarized hydrogen atoms offers the advantage of a substantial insensitivity of hydrogen maser frequency against the resonance excitation of low frequency.  $\Delta m_F = \pm 1$  Zeeman transitions at low-magnetic fields. This feature is of particular importance for the application of the Zeeman transition linewidth quenching method for maser cavity tuning purposes. Various experimental techniques are described and analyzed, which can be used for the preparation of hydrogen atom ensembles populating the magnetic substates of the  $F = 1$  level of the atomic hydrogen ground state, which do not possess a resulting polarization. The influence of these atomic beam preparation techniques on hydrogen maser amplitude are discussed. Both the saturation of atomic beam induced low frequency,  $\Delta m_F = \pm 1$  Zeeman transitions and a 90 degrees non-adiabatic magnetic field flop result in a vanishing hydrogen atom polarization, but deteriorate the maser amplitude considerably. A periodic switching between 0 and 180 degrees non-adiabatic magnetic field flop conditions, performed with a periodicity which is fast compared to the relaxation rates within the hydrogen maser storage bulb, results in an ensemble of hydrogen atoms with vanishing polarization and does not deteriorate the hydrogen maser oscillation characteristics. Author (TAB)

**N66-38187#** Korad Corp., Santa Monica, Calif.

**LASER-PUMPED LASER Final Report, 16 Apr. 1965-15 Apr. 1966**

R. H. Hoskins, O. M. Cernichiar, B. Mc Fairland, R. C. Pastor, and B. H. Soffer Jul. 1966 35 p refs

(Contract Nonr-4877(00))

(AD-636953) CFSTI: HC \$2.00/MF \$0.50

The objective of the program was to investigate an approach to high-powered lasers which would result in lower thresholds than Raman type lasers (thus avoiding stimulated Raman and Brillouin complications). No encouraging results were obtained from this laser-pumped laser scheme which included the investigation of a reasonable cross-section of materials—quinene sulphate, phthalocyanine, and methylene blue, representing three different types of families of molecules.

Author (TAB)

**N66-38204#** Honeywell, Inc., St. Paul, Minn. Research Dept. **STUDY OF TECHNIQUES FOR DETECTION AND MEASUREMENT OF CLEAR AIR TURBULENCE Final Report, 15 Nov. 1962-30 Oct. 1965**

Raymond E. Zirkle, Jr. 18 Jan. 1966 135 p refs */its Rept.-1540-FRI*

(Contract AF 19(628)-2376)

(AFCR-66-115; AD-636325) CFSTI: HC \$4.00/MF \$1.00

Two general ways in which laser optical radar (OPTAR) might be useful for clear air turbulence detection were examined. The first method involves spectral analysis of Doppler-shifted light, backscattered by moving particles, to provide measures of average and gust spectrum velocity components. The second method involves the mapping of particle formations arrayed in the atmosphere by correlates of rough flying conditions such as wind shear, the jet stream, mountain waves, etc. Calculations show that the particulate matter of the troposphere which dominates optical backscatter is dynamically suitable for the mapping of wind motions consistent with anticipated requirements of CAT detection. Experiments by other groups have shown that laser doppler methods can measure particle velocities in the laboratory. Experimental extensions of these techniques will be needed to apply the concept to aircraft. An experimental program with pulsed ruby laser optars was conducted. Particle arrays were detected in both laboratory and field environments, but no evidence was obtained indicating a correlation with turbulent conditions. Laboratory turbulence-generated refractive index changes were much higher than those encountered in the atmosphere. Field tests at Rollinsville, Colorado were inconclusive due to poor weather conditions. Many cloud returns were obtained, but they were not related to mountain waves or turbulence. Airborne optars should be used in further work of this type to provide mobility and to allow direct correlation between signals received and turbulence encountered. Author (TAB)

**N66-38236#** Army Electronics Labs., Fort Monmouth, N. J. **BEHAVIOR OF HYDROGEN MASERS UNDER COHERENT LOW-FREQUENCY ZEEMAN TRANSITION EXCITATION**

Harro G. Andresen Jun. 1966 106 p refs

(ECOM-2706; AD-636727) CFSTI: HC \$4.00/MF \$0.75

Contents: hydrogen maser frequency shifts due to coherently excited, low-frequency Zeeman transitions; hydrogen maser amplitude response due to coherently excited, low-frequency Zeeman transitions; spin-exchange effects on hydrogen maser amplitude response to low-frequency Zeeman transitions; oscillation characteristics for hydrogen maser operation with coherently excited, low-frequency Zeeman transitions. TAB

**N66-38247#** Honeywell, Inc., Hopkins, Minn. Corporate Research Center.

**MECHANISMS OF LASER-SURFACE INTERACTIONS Final Report**

J. F. Ready, E. Bernal G., and L. P. Levine May 1966 100 p refs

(Contract DA-11-022-AMC-1749)

(AD-636680) CFSTI: HC \$3.00/MF \$0.75

Major emphasis is placed on the measurements of high energy neutral particles in the quadrupole spectrometer, and analysis of the pulse shapes of the ions emitted in the time-of-flight spectrometer, in order to infer the velocity distribution of the original material. The pulses observed in the high speed neutral particle emission studies appeared rapid compared to the longer and slower pulses from the gas desorption work. It is shown that the surface interaction produces ultraviolet radiation at wavelengths down to 1100Å, and high speed neutral atoms or molecules with energies of the order of 100eV. The pulse shapes obtained with the time-of-flight spectrometer are analyzed, and distributions that indicate a directed component of the ion energy, plus a smaller random component superimposed on the direct component are obtained. Results indicate that the energies are of the same order of magnitude, for ions of different species emitted from a given target. The shapes of the velocity distributions indicate departures from a Maxwellian distribution. H.S.W.

**N66-38268#** Florence Univ. (Italy).

**EXPERIMENTAL VERIFICATION OF FOX AND LI PATTERNS IN OPEN RESONATORS** Interim Scientific Report No. 3

P. F. Checcacci and A. M. Scheggi Feb. 1966 18 p refs  
(Contract AF 61(052)-871)  
(AFCRL-66-496; AD-636790) CFSTI: HC \$1.00/MF \$0.50

An experiment with a microwave open resonator of the Fabry-Perot type is described. The field distribution of the fundamental mode has been accurately determined. A very good agreement has been found with the distributions computed by Fox and Li. It has been verified that flatness and alignment requirements are extremely critical and can explain the well known difficulty to obtain in practice the Fox and Li patterns. Author (TAB)

**N66-38449#** Raytheon Co., Waltham, Mass. Research Div.  
**HIGH POWER GAS LASER RESEARCH** Final Technical Report, 15 Jun. 1965-14 Mar. 1966

F. Horrigan [1966] 88 p refs  
(Contract DA-01-021-AMC-12427(Z))  
(S-865; AD-637023) CFSTI: HC \$3.00/MF \$0.75

The report discusses the investigation and optimization of a high-power high-efficiency CW gas laser utilizing a dc discharge excited, flowing mixture of carbon dioxide, nitrogen, and helium as the active laser medium. Continuous laser powers of 50 to 60 watts per meter length of active medium were obtained in well-collimated beams at various wavelengths in the neighborhood of 10.6 microns with an efficiency of more than 10 percent. The work involved optimization via variation of the parameters, i.e., gas flow rates, partial pressures of component, discharge current, optical coupling, additives, etc., as well as studies of: (1) optical materials suitable for 10 microns radiation of the relative merits of various optical coupling schemes; (2) the variations of single pass gain with the parameters; (3) the role of electrochemical effects; (4) the lifetimes of the laser level via direct afterglow investigation; (5) spectroscopy in both the visible and the infrared, and (6) Q-spoiling. A detailed picture of the operating principles of the CO<sub>2</sub> laser is presented along with estimates of the ultimate powers (several watts per cc of active medium) and efficiencies (20 to 40%) obtainable and an indication of those aspects that are least understood and deserving of future effort. Author (TAB)

**N66-38554\*#** Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.  
**FREQUENCY STABILITY DETERMINATION FOR TWO HYDROGEN MASERS**

R. L. Sydnor *In its* Space Programs Sum. No. 37-40, Vol. III 31 Jul. 1966 p 26-29 refs (See N66-38546 23-07) CFSTI: HC \$3.00/MF \$1.00

The frequency difference between two hydrogen masers was monitored to obtain data on their stability. While the extrema of a typical record for approximately one month indicates a peak-to-peak stability figure of  $27 \times 10^{-13}$  for the two masers, a number of problems have occurred which indicate that maser performance could be much better. Graphs indicate that three failures which occurred during the recording period were all preceded or followed by large variations in frequency. By replacing the vacuum tubes in the RF source, the power was increased to well above the discharge threshold, and the high failure rate due to this difficulty was eliminated. Failures that occurred in the temperature control, pressure control, voltage regulator, and high voltage circuits were attributed mostly to poor packaging and quality control; and repackaging and redesign of the electronics will be aimed at more reliable operation, ease of maintenance, and better space utilization. Design of the maser will not be changed since it appears to be operating as expected when the controllers and RF discharge are performing correctly. M.W.R.

**N66-38555\*#** Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.  
**FREQUENCY GENERATION AND CONTROL: HYDROGEN MASER FREQUENCY STANDARD**

W. H. Higa *In its* Space Programs Sum. No. 37-40, Vol. III 31 Jul. 1966 p 29-30 ref (See N66-38546 23-07) CFSTI: HC \$3.00/MF \$1.00

A dual-channel traveling wave maser for the 1420-MHz hydrogen line frequency is being assembled that will permit evaluation of the short-term fluctuations of a hydrogen maser. Properties of such an atomic frequency standard are discussed; and it is noted that the long-term stability of the oscillator is improved by using a low Q-cavity. The cavity acts like a flywheel for the atoms and introduces a system time constant, and a high Q-cavity is also desirable to allow for operation at reduced atomic beam intensity. Results indicate the importance of operating at high power levels to improve short-term stability. The need for low-noise amplifiers is considered to be evident if stability measurements are to be made by comparing two hydrogen masers. M.W.R.

**N66-38567\*#** Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.  
**MICROWAVE MASER DEVELOPMENT: TRAVELING WAVE MASER FOR THE VENUS DEEP SPACE STATION**

R. Clauss *In its* Space Programs Sum. No. 37-40, Vol. III 31 Jul. 1966 p 90-93 refs (See N66-38546 23-07) CFSTI: HC \$3.00/MF \$1.00

A traveling-wave maser (TWM) has been completed for future use on the 85-ft antenna at the Venus DSS. Although the TWM is a copy of the amplifier previously delivered to the Mars DSS slight changes in loading have improved the forward loss characteristics. An "in-line quarter-wave thermal short" is used to cool the center conductor of the signal input transmission line. These changes have reduced the equivalent input noise temperature of the TWM (in comparison with previous TWM's). Calculated and measured values agree on a TWM noise temperature of 5°K at the waveguide interface. Author

**N66-38698#** Institut für Plasmaphysik G.m.b.H., Garching (West Germany).

**INVESTIGATIONS ON MODE SELECTION AND PULSE AMPLIFICATION IN RUBY LASERS [UNTERSUCHUNGEN ZUR MODENSELEKTION UND IMPULSVERSTÄRKUNG IN RUBINLASERN]**

R. Klockenkamper Mar. 1966 19 p In GERMAN, ENGLISH summary  
(IPP-4/49) CFSTI: HC \$1.00/MF \$0.50

Two ruby rods with mutually perpendicular optical axes and positioned behind one another are switched together via a Kerr cell to produce an optical giant pulse. When a high population inversion has been attained a resonator in which the emission threshold is suddenly exceeded is formed by the two ruby lasers at the moment of the voltage pulse, the latter causing the plane of oscillation to rotate 90 deg. While this circuit can be triggered accurately to less than 200 ns, the jitter in the so-called passive pulse amplifier amounts to several  $\mu$ s. The blocking action of an absorbent organic dye solution (methylene blue) is used here to increase the population inversion. With selective saturation of the absorption by the ruby fluorescent light taking place, the Q of the previously detuned optical resonant cavity is raised to the old

**N66-39411#** Joint Publications Research Service, Washington, D. C.

**HEATING OF A BILAYER SHEET IN WELDING WITH A LASER BEAM**

N. W. Rykalin, A. A. Uglov, and N. I. Makarov 27 Sep. 1966 12 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 19, no. 3, 1966 p 565-568  
(JPRS-37856; TT-66-34284) CFSTI: \$1.00



The temperature distribution in a bilayer sheet subjected to a heat source located on its surface is considered as one of the problem areas in the application of lasers for use in welding. The equations which describe this problem are provided, and solutions for these equations are given. H.S.W.

**N66-39446\*** North American Aviation, Inc., Downey, Calif. Space and Information Systems Div.  
**REQUIREMENTS STUDY FOR SYSTEM IMPLEMENTATION OF AN ATMOSPHERIC LASER PROPAGATION EXPERIMENT PROGRAM, VOLUME II**

H. E. Henry, R. N. Hathaway, J. O. Garvey, E. J. Stegelmann, D. G. Lubnau et al 8 Nov. 1965 301 p refs  
 (Contract NASw-977)  
 (NASA-CR-78855; SID-65-1466) CFSTI: HC \$7.00/MF \$1.75  
 CSCL 20E

The system implementation study of the laser space communications system is reported. A description and component performance analysis is given for each experiment, including experiment configuration and the required equipment list. A system synthesis is presented, with experiments grouped into a basic application-oriented program, a minimum theory-oriented program, and the maximum program. Site support considerations are discussed, including the selection of suitable sites, and information on available weather facilities and statistical weather data. Discussions are presented on ground, airborne, balloon, and satellite links. It was concluded that: (1) System components and well-instrumented accessible sites for stationary ground-based links are available. (2) Aircraft and balloon platforms with required support are also available. (3) A thorough field testing with ground-based and airborne platforms is necessary. N.E.N.

**N66-39447\*** North American Aviation, Inc., Downey, Calif. Space and Information Systems Div.  
**PROGRAM SPECIFICATION PLAN FOR THE DETERMINATION OF ATMOSPHERIC EFFECTS ON LASER SPACE COMMUNICATIONS, VOLUME II**

R. N. Hathaway, D. L. Fried, and H. E. Henry 9 Nov. 1965 78 p  
 (Contract NASw-977)  
 (NASA-CR-78856; SID-65-1467) CFSTI: HC \$3.00/MF \$0.75  
 CSCL 20E

The program specification of the laser space communications system study is summarized. The approach to a program of field experimentation to determine atmospheric effects on laser propagation is outlined. The theoretical versus experimental aspects were considered, emphasizing space and non-space tests, and performance characteristics of experimental equipment. Anticipated problem areas are identified as (1) the unknown reliability of laboratory equipment in a field environment and (2) the utilization of small specialized test teams with a wide geographic spread. The program sequence recommendations, schedule, and implementation cost estimates are included. N.E.N.

**N66-39448\*** North American Aviation, Inc., Downey, Calif. Space and Information Systems Div.  
**LASER SPACE COMMUNICATIONS STUDY (LACE) Final Summary Report**  
 12 Nov. 1965 64 p refs  
 (Contract NASw-977)  
 (NASA-CR-78854; SID-65-1468) CFSTI: HC \$3.00/MF \$0.75  
 CSCL 20E

The results, conclusions, and recommendations of the study for the implementation of an experimental program to determine the atmospheric effects on laser space-ground communication are summarized. The problem definition, experiment specification, and system implementation study are outlined. N.E.N.

**N66-39473#** Aerospace Medical Div. Aerospace Medical Research Labs.

**A STUDY OF LIGHT MODULATION AND SCANNING TECHNIQUES FOR APPLICATION TO SIMULATION DISPLAY GENERATION Final Report, Jun. 1964-Jun. 1965**

W. L. Foley Mar. 1966 58 p refs  
 (AMRL-TR-66-9; AD-637307) CFSTI: HC \$3.00/MF \$0.50

Various techniques for modulation and scanning of coherent light are analyzed for application to the generation of high resolution high contrast displays for simulation. A number of possible techniques are discussed in the main body of the report. The individual discussions include a brief description of the principles of operation together with capabilities relative to bandwidth, contrast ratio, deflection angle, alignment, sensitivity, ease of fabrication, and handling. This is based somewhat upon voltage and power requirements over range of operation.

Author (TAB)

**N66-39487#** Stanford Univ., Calif. Microwave Lab.  
**THE MEASUREMENT OF SEVERAL OPTICAL NONLINEARITIES USING FOCUSED GAUSSIAN LASER BEAMS**

John E. Bjorkholm Jan. 1966 133 p refs  
 (Contract AF 49(638)-1525)  
 (ML-1405; AFOSR-66-0490; AD-637500) CFSTI: HC \$4.00/MF \$1.00

The twofold purpose of this study was: (1) to analyze optical second-harmonic generation (SHG) in the focus of the lowest order transverse mode of a cw gas laser beam; (2) to utilize the power enhancement available from focusing to measure smaller nonlinearities on a cw basis than previously had been done. The results of the analysis give the dependence of SHG in index-matching crystals upon the crystal length, the crystal double-refraction angle, and the laser beam focal spot size  $w_0$ . The dependence of SHG upon  $w_0$  was measured using varying degrees of focusing. The absolute power levels were checked by measuring the absolute value of the nonlinearity in ADP. The excellent agreement between analysis and experiment means that focused beams can be used to make accurate measurements of crystal nonlinearities. The second section of this study describes measurements of several optical nonlinearities in calcite made under conditions of optimum focusing using cw gas lasers. Since calcite has a center of inversion, the nonlinearities measured are of higher order than normal dipolar SHG; the resulting effects are much weaker, requiring the use of focused beams to detect them. Measurements were made of quadrupole-type SHG, electric-field-induced SHG, and the quadratic electro-optic effect. Author (TAB)

**N66-39733#** Air Force Cambridge Research Labs., Bedford, Mass. Microwave Physics Lab.

**THE SAGNAC EFFECT**

E. J. Post May 1966 51 p refs /ts Phys. Sci. Res. Papers No. 224

(AFCLR-66-311; AD-637717) CFSTI: HC \$3.00/MF \$0.50

A revived interest in the Sagnac effect, because of its navigational potentialities has recently resulted from the development of the self-oscillating laser version of the original Sagnac interferometer. Where the Sagnac interferometer or ring laser is an example of an electromagnetic sensor of absolute rotation, it was believed that some historical and theoretical background information might be useful in exploring and further evaluating the possibilities of electromagnetic sensing of absolute rotation. A critical literature study of the many experimental ramifications and the older kinematical theory of the effect is presented. This geometric optical theory is then complemented and compared with more recent work that is based on a physical optical analysis using a complete electromagnetic description of the phenomenon. Author (TAB)

**N66-39741#** Mithras, Inc., Cambridge, Mass.

**LIGAND FIELD MILLIMETER MASER Final Report, Feb. 15, 1964-Feb. 14, 1966**

Charles S. Naiman, Jack Schwartz, and Arthur Linz Apr. 1966  
38 p refs

(Contract AF 19(628)-4006)

(MC-64-102-R2; AFCRL-66-357; AD-637683) CFSTI: HC \$2.00/MF \$0.50

A report is given of work dealing with theoretical and experimental investigation of the properties of ferroelectric materials leading to the development of materials with the special properties necessary for the operation of a Ligand Field Maser in the millimeter range. Measurement of ligand fields near ground state crossovers by optical and microwave spectroscopy are discussed as well as magnetometer methods. Means by which Ligand Field Variation may be accomplished are considered, with associated experimental techniques. Experience in the preparation of suitable materials and growth of single crystals are presented, and various possibilities analyzed. (Author) TAB

**N66-39840#** Institute for Perception RVO-TNO, Soesterberg (Netherlands).

**SOME CONSIDERATIONS ON EYE HAZARDS WITH LASERS**

J. J. Vos 1966 26 p refs

(TDCK-46027; IZF-1966-4) CFSTI: HC \$2.00/MF \$0.50

Eye hazards by laser radiation are described and discussed on the basis of experimental data on animals, theoretical consideration on heat dissipation, and recent data on ocular imagery. Critical doses are determined and thicknesses calculated for protective filters. Tentative safety prescriptions, on this basis, conclude the report. Author

**N66-39911#** General Dynamics Corp., San Diego, Calif. John Jay Hopkins Lab. for Pure and Applied Science.

**RADIATION EFFECTS ON LASERS Technical Report, Jul. 1, 1965-May 31, 1966**

D. M. J. Compton and R. A. Cesena 21 Sep. 1966 77 p refs

(Contract NAS12-32)

(NASA-CR-79108; GA-7274) CFSTI: HC \$2.00/MF \$0.75 CSCL 20E

In a study on the effects of space radiation on lasers, a discussion is given of the mechanisms by which these effects can occur, and of a suitable choice of parameters to be measured. These include active tests: measurements of coherence and of near and far field patterns; passive tests: optical transmission measurements; and scattering of transmitted gas laser light. Methods of measuring these parameters were developed and applied to optically pumped lasers such as ruby,  $\text{CaWO}_4:\text{Nd}$ ,  $\text{YAG}:\text{Nd}$  and Glass: Nd, and GaAs diode injection lasers, before and after irradiation with 32 Mev protons, 30 Mev electrons, and reactor  $\gamma$  rays. For GaAs diodes, irradiation does not change the current voltage curve, but degrades the optical output and changes the output wavelength spectrum. Coherence and far-field patterns are changed for all lasers if the input power is increased after irradiation to keep output power constant, and heating seems to be a more important cause of these changes than any direct effects of irradiation. Author

**N66-39966#** Melpar, Inc., Falls Church, Va. Electronics Research Lab.

**A STUDY OF LASER WAVE SCATTERING DUE TO REFRACTIVE INDEX PERTURBATIONS IN THE PROPAGATING MEDIUM Final Report, 5 Oct. 1965-15 Aug. 1966**

S. B. Sample and S. J. Campanella Aug. 1966 97 p refs

(Contract NAS9-5315)

(NASA-CR-65553) CFSTI: HC \$2.50/MF \$0.75 CSCL 20F

The purpose of this contract was to expand the GT-7 laser communicator experiment into a scientific study of laser wave scattering due to refractive index perturbations in the atmosphere. This report contains a complete description of the two data recording and processing systems that were constructed on the contract. It also describes the activities of the personnel who were stationed at the White Sands and Ascension Island Laser Communicator Sites during the flight of GT-7. An analysis of the data obtained during static laser wave propagation experiments at the WSMR site is included. Finally, the report presents recommendations for future space-to-earth and ground-based laser wave propagation experiments that seem necessary in order to further clarify the nature of optical propagation over great distances in the atmosphere. Author

**N66-39992#** North American Aviation, Inc., Downey, Calif. Space and Information Systems Div.

**SPECIFICATION OF ATMOSPHERIC LASER PROPAGATION EXPERIMENTS, VOLUME II**

15 Sep. 1965 refs

(Contract NASw-977)

(NASA-CR-79094; SID-65-1275) CFSTI: HC \$5.00/MF \$1.00 CSCL 20E

Specifications are presented for a comprehensive experimental program to determine atmospheric effects on laser propagation, with particular emphasis on effects related to optical space-ground communication. The interrelationships between the optical effect, experimental variables, and individual variables are examined in a discussion on measurement approach. Also included are some basic interpretations of beam fluctuations in a turbulent atmosphere, a glossary of related terms and proposed modifications in the approach to the meteorological experiments. Experimental procedures are outlined, and error and measurement analyses are prescribed. Error sources described are the result of considerations such as beam splitters, piezoelectric crystals, entrance aperture, signal to noise and gain, background, measurement time and number of measurements, mechanical vibration, tracking, circuitry maladjustments, modulators, and spot size. S.P.

## 1967 STAR ENTRIES

**N67-10283#** Florence Univ. (Italy). Inst. of Electromagnetic Waves.

**LASER CAVITIES. PART I: RESEARCH ON OPEN RESONATORS. PART II: BEHAVIOR OF THE OUTPUT FROM A MANY ELEMENT LASER Annual Summary Report, 1 Apr. 1965-30 Mar. 1966**

P. F. Checchacci, A. M. Scheggi, R. Pratesi, and L. Ronchi 30 Apr. 1966 68 p refs

(Contract AF 61(052)-871)

(ASR-1; AFCRL-66-638; AD-638193) CFSTI: HC \$3.00/MF \$0.75

A summary of the researches completed during the last year is given along with detailed descriptions of the latest results. Investigation carried out on microwave models of laser resonators and study of new types of open resonators are reported in Part I. Part II is concerned with the study of the time behavior of the light emitted from a many element laser (MEL) Author (TAB)

**N67-10437#** Library of Congress, Washington, D. C. Aerospace Technology Div.

**BLEACHING MECHANISM OF ORGANIC PHOTOTROPIC SUBSTANCES USED IN RUBY LASERS AS SWITCHES**  
**Surveys of Foreign Scientific and Technical Literature**

Frances Mc Dowell 26 Sep 1966 9 p refs Transl. into ENGLISH from Zh. Prikl. Spektroskopii (USSR), v. 4, no. 5, 1966 p 410-414

(ATD-66-119)

The bleaching process of organic phototropic switches under the effect of ruby laser emission is examined. The effect of the atomic constants of solutions on the bleaching process is evaluated.

Author

**N67-10788#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

**ELECTRO-OPTIC LIGHT MODULATORS**

E Hirschmann Washington, NASA, Nov. 1966 17 p refs (NASA-TN-D-3678) CFSTI: HC \$1.00/MF \$0.50 CSCL 20E

This report discusses the performance of  $KD_2P$ , GaAs and HMTA light modulators. The  $KD_2P$  crystals have given excellent results in modulating a laser beam. Alignment of the crystal with relation to the light beam is very critical. GaAs appears at this time to be the best electro-optic crystal material for a light modulator in the infrared region between 0.9 and 16 microns. Strain-free GaAs can be grown with resistivities exceeding  $10^8$  ohm-cm. At this time, the use of HMTA as a light modulator material does not appear promising.

Author

**N67-10948#** Materials Research Corp., Orangeburg, N. Y.  
**INVESTIGATION OF ELECTRON BEAM PROCESSING OF ALUMINUM OXIDE AND RELATED MATERIALS**

W. Class, Harvey R. Nesor, and O. T. Murray 15 Jun. 1966 50 p refs

(Contract AF 19(628)-4089)

(AFCLR-66-473; SR-4; AD-637800) CFSTI: HC \$2.00/MF \$0.50

Float-zone crystal growth techniques were applied to the preparation of refractory nonconducting crystals currently of interest to the laser technology. In these studies, sapphire and ruby served as test materials to evaluate the advantages and limitations of the float-zone methods. Two distinct procedures were employed to produce the molten zones in non-conducting materials. An electron beam technique utilizing a self-accelerated electron gun of annular geometry was the first process examined during the program. A second technique - the production of a floating zone by the use of a hollow cathode electrical discharge - was also developed. Both methods yielded single crystals of relatively high perfection as measured by the density of dislocations appearing in the grown crystals. Further evaluation is necessary to fully determine if the optical perfection of these crystals is commensurate with the stringent requirements demanded of a good laser crystal.

TAB

**N67-10950#** Minnesota Univ., Minneapolis. Dept. of Electrical Engineering.

**INVESTIGATIONS OF GIANT PULSING METHODS IN RUBY LASERS**

David Roy Dean and R. J. Collins Aug. 1966 81 p refs

(Contract Nonr-710(61))

(TR-4; AD-637825) CFSTI: HC \$3.00/MF \$0.75

The findings from investigations into producing giant optical radiation pulses from ruby lasers by control of static cavity geometry are discussed, the experimental evidence produced by the investigations is presented, and a phenomenological model is proposed. Optimum ranges for the cavity parameters of length, mirror reflectivity, and misalignment are established. For the new giant pulsing method the output pulses produced by the static cavity geometry control method have been found to be similar to the output pulses obtained by the present conventional giant pulsing methods.

Author (TAB)

**N67-10968#** New York Eye and Ear Infirmary, N. Y.

**INVESTIGATION OF THE EFFECTS OF RUBY LASER RADIATION ON OCULAR TISSUE**

Jerry H. Jacobson, Harold W. Najac, and Bossom Cooper Phila., Pa., Frankford Arsenal, Jun. 1966 34 p ref

(Contract DA-36-038-AMC-685(A))

(FA-R-1815; AD-638917) CFSTI: HC \$2.00/MF \$0.50

A series of laboratory and field experiments on rabbits were conducted by the New York Eye and Ear Infirmary in order to establish tentative safe operational distances and conditions for use of the Frankford Arsenal XM23 laser rangefinder. The measured far field corneal threshold dose for rabbits was tentatively determined to be  $5 \times 10$  to the minus 7th power joule/sq. cm. From this a possible human corneal threshold was calculated as 0.00000145 joule/sq. cm. Based on this value, tentative safe operational distances were calculated as being 6460 meters for night (8 mm pupil), 1615 meters for twilight (4 mm pupil), and 914 meters for daylight (3 mm pupil).

Author (TAB)

**N67-10978#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**TEMPERATURE DEPENDENCE OF FREQUENCY AND EMISSION WIDTH OF THE R1 LINE OF RUBY**

M. Ye. Movsesyan and Yu. S. Chilingaryan 25 Apr. 1966 8 p refs Transl. into ENGLISH from Akad. Nauk Armyansk SSR (Erevan), v. 39, no. 4, 1964 p 217-219

(FTD-TT-65-2006; TT-66-62240; AD-638901)

The conditions for induced radiation are most easily fulfilled for the maximum line of luminescence, and consequently there should be complete coincidence of the dependences on the temperature of the displacement on the maxima of the line of luminescence and the induced emission. In this work there was investigated the shift of the maximum of the line of fluorescence of Ruby R1 as depends on the temperature, and this change was compared with the temperature change of the maximum of induced emission.

TAB

**N67-11104#** Johns Hopkins Univ., Baltimore, Md. Dept. of Physics.

**LASER RAMAN SCATTERING STUDIES OF CRYSTALS**  
**Annual Technical Report, 15 Jun. 1965-15 Jun. 1966**

Herman Z. Cummins Jun. 1966 16 p refs

(Contract Nonr-4010(06) ARPA Order-306-63)

(AD-637256) CFSTI: HC \$2.00/MF \$0.50

Laser excited raman scattering has been explored as a technique for studying crystals containing impurities, particularly the rare-earth doped crystals widely used as laser materials. Spectra obtained with both and  $A(+)$ 4880 A laser and a He-Ne 6328 A laser are given for  $CaF_2$  and  $CaWO_4$  crystals, both pure and doped with various rare earths. To date, the doped crystals studied have either produced strong fluorescence or else given spectra which are indistinguishable from those of the pure crystals. Modification of the instrumentation is discussed which is currently in progress. With the improved apparatus, further efforts are planned to look for electronic raman structure of the rare earth ions as well as modification of the vibrational raman structure due to perturbation of the lattice by the impurities.

Author (TAB)

**N67-11161#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**INTERFERENCE MEASUREMENT OF HOMOGENEITY OF RUBY RESONATOR FOR THE LASER**

V. Bocor and V. Kment 31 Aug. 1966 13 p refs Transl. into ENGLISH from Jemna Mechanika a Optika (Czechoslovakia), no. 1, 1965 p 5-6

(FTD-TT-66-44; TT-66-62249; AD-638978) CFSTI: HC \$1.00/MF \$0.50

The report describes experience with interference control of the homogeneity of ruby stick (resonator) for laser. An Askenia IG 140 interferometer was used in the arrangement of the Michelson interferometer with the use of lines 6438 Å Cd and 6328 Å He-Ne lasers  
Author (TAB)

**N67-11313#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**JOURNAL OF EXPERIMENTAL AND THEORETICAL PHYSICS**

1 Apr. 1966 10 p refs Transl. into ENGLISH from Zh. Eksperim. Teor. Fiz. (Moscow) v. 1, no. 4, 15 May 1965 p 4-9, 21-24 (FTD-MT-65-399; TT-66-62091; AD-637413) CFSTI: HC \$1.00/MF\$0.50

**CONTENTS:**

1. AMPLIFICATION OF COHERENT RADIATION; USING THE EFFECT OF INDUCED RAMAN SCATTERING B. A. Akanayev, S. A. Akhmanov, and R. V. Khokhlov p 1-5 refs (See N67-11314 02-16)
2. SPECTRAL CHARACTERISTICS OF A GAS LASER WITH A TRAVELING WAVE S. N. Bagayev, V. S. Kuznetsov, Yu. V. Troitskiy, and B. I. Troshin p 7-10 ref (See N67-11315 02-16)

**N67-11314#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**AMPLIFICATION OF COHERENT RADIATION, USING THE EFFECT OF INDUCED RAMAN SCATTERING**

B. A. Akanayev, S. A. Akhmanov, and R. V. Khokhlov *In its J. of Exptl. and Theoret. Phys.* 1 Apr. 1966 p 1-5 refs (See N67-11313 02-16) CFSTI: HC \$1.00/MF\$0.50

A combination Raman generator is described which is based on the phenomenon of induced Raman scattering for the generation and amplification of the Stokes wave. Excitation of the proposed generator is accomplished using a ruby laser with Q-modulation. The beam of light from the ruby laser source is divided into two beams one of which passes along the benzenes irradiated by pumping, the other along an air filled vessel. Amplification is determined by comparing the ratio of the intensities of Stokes and Rayleigh components of each beam. Registration of amplification is produced on photographic plates. Preliminary experiments showed that by using the phenomenon of induced Raman scattering it is possible to construct a receiver of coherent radiation. S.C.W.

**N67-11315#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**SPECTRAL CHARACTERISTICS OF A GAS LASER WITH A TRAVELING WAVE**

S. N. Bagayev, V. S. Kuznetsov, Yu. V. Troitskiy, and B. I. Troshin *In its J. of Exptl. and Theoret. Phys.* 1 Apr. 1966 p 7-10 ref (See N67-11313 02-16) CFSTI: HC \$1.00/MF\$0.50

The effects of decoupling of longitudinal modes on multimodality of a gas laser in a resonator with a traveling wave propagating in one direction were studied. A gas laser on the wavelength  $\lambda = 6328\text{\AA}$  with an annular resonator was prepared in which clockwise (A) and counter-clockwise (B) traveling waves were generated. The resonator was formed by three mirrors, two of which had a transmission of 0.2% and 3.4%, respectively. The discharge tube was filled with a mixture of neon and helium in a ratio of 1:5 with a total pressure of 0.5 mm Hg. To produce a traveling wave with one direction, an additional mirror was used which reflected part of the energy of wave B to A. As a result, during generation the intensity of wave A was five to seven times greater than that of wave B. Interferograms showed that the number of modes in this system oscillated from one to two. Results indicated that the generated modes did not travel over the entire

spectral lines but were connected with a certain section of them, and that the power of generation did not change with time. It is concluded that elimination of spatial heterogeneity of the field in a laser resonator permits strengthening of the bond between types of oscillation (even in case of non-uniformly widened lines) and makes it possible to obtain adequate power generation with one to two longitudinal modes. S.C.W.

**N67-11380#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

**AN INTERFEROMETRIC RANGING SYSTEM**

Diane Marie Tillson Sep. 1966 75 p refs (NASA-TM-X-55608; X-524-66-408) CFSTI: HC \$2.50/MF \$0.75 CSCL 20E

The need for an accurate linear measuring system in the range of one hundred meters has resulted in the investigation of potential laser applicability. An interferometric type ranging system which utilizes a continuous-wave laser is analyzed. Theoretical analysis shows that one can utilize the difference frequency between adjacent TEM longitudinal modes of a cw laser to make accurate distance measurements. Equations are developed to establish mathematically the relation between phase information, which results from the photo-mixing of two monochromatic light beams, and the path lengths of these two signals. The validity of this idea is verified experimentally. Measurements which were accurate to a half millimeter were obtained using this ranging system. The accuracy of the system is limited by the system's noise level and by the laser stability. Author

**N67-11738#** Case Inst. of Tech., Cleveland, Ohio.

**DEVELOPMENT OF LASERS FOR PLASMA DIAGNOSTICS**

W. B. Johnson and T. P. Sosnowski Jul. 1964 114 p refs (Grant NsG-198)

(NASA-CR-79511; A-29) CFSTI: HC \$4.00/MF \$0.75 CSCL 20E

Discussed is the construction of an optical heterodyne system for measuring the electron density of a plasma. Initially the scheme is established theoretically, followed by a detailed account of the construction of the helium-neon gaseous lasers. Design parameters are established to determine the most efficient means of operation. It is found that the laser can operate at gas pressures and input currents from 1.6 mm to greater than 10 mm Hg pressure and 5 ma to greater than 60 ma respectively, with optimum operation occurring at 3.8 mm Hg pressure at a current of 30 ma. The heterodyning of two laser beams is then considered; the stability of the resultant beat frequency is found to be seriously impaired by such environmental factors as building vibration and very small temperature fluctuations. The minimum frequency drift encountered in the experiment was approximately 50 kc/s in a 1 sec period and is comparable to the frequency shift obtained with an electron density of  $10^{12}$  electrons/cc. Recommendations are then made which should either mitigate or eliminate the causes of frequency drift. Author

**N67-11969#** Joint Publications Research Service, Washington, D. C.

**FEATURES OF CZECHOSLOVAK-PRODUCED GAS LASERS**

Frantisek Petru 27 Sep. 1966 12 p Transl. into ENGLISH from Sdelovaci Technika (Prague), v. 1966, no. 6, Jun. 1966 p 208-209

(GUO-2177) CFSTI: \$1.00

Technical aspects of gas lasers, including basic resonator setup, beam radius and polarization, and resonator adjustment, are presented. The use of these gas lasers is advised in cases where the emphasis is on monochromaticity and coherence, directionality, high intensity, perfect polarization, and continuous operation of discharge radiation. S.P.

**N67-12260\*** Ohio State Univ. Research Foundation, Columbus. Dept. of Electrical Engineering.

**A PRELIMINARY INVESTIGATION OF LASER ACTION ASSISTED BY OXIDIZED HYDROCARBONS**

Benjamin Franklin Jacoby 7 Oct. 1966 12 p / Its Rept.-1093-32 (Grant NSG-74-60)

(NASA-CR-80090) CFSTI: HC\$1.00/MF\$0.50 CSCL 20E

This report describes the apparatus constructed to investigate the possibility of new laser line in the infrared and far infrared regions and some preliminary results are presented of a study where CO<sub>2</sub> and CO were generated by a chemical reaction within the discharge tube and made to laser. Author

**N67-12294# Pacific Missile Range, Point Mugu, Calif. DESCRIPTION AND APPLICATION OF LASER RADAR AT PACIFIC MISSILE RANGE**

J. L. Karney, J. E. Masterson, and W. E. Hoehne 17 Aug. 1966 22 p ref

(PMR-TM-66-6; AD-638754) CFSTI: HC\$1.00/MF\$0.50

The prototype device, called the Mark III Lidar (light detection and ranging) is presently undergoing operational evaluation. A preliminary description of the data and results obtained are given. The lidar is a new and unique tool which promises to provide meteorologists and atmospheric physicists a means to accomplish tasks not possible using present equipment. The Lidar may someday assist the meteorologist in making short-range forecasts by providing slant-range visibility data and quantitative measurements of stratus density and fog thickness. The Lidar is capable of determining precise ranges to clouds (together with their bases and tops), measuring the height of temperature inversions, and detecting atmospheric phenomena in apparently clear atmospheres. At the present time, the Lidar data are used in conjunction with observations from other sources to supplement and improve existing weather information. With relatively minor modifications, the Lidar could significantly augment the present methods of gathering atmospheric data. Author (TAB)

**N67-12314\*# Post Office Engineering Dept., London (England). THE HELIUM SYSTEM OF THE MASER INSTALLATION AT THE GOONHILLY SATELLITE-COMMUNICATION EARTH STATION**

H. N. Daglish and M. R. Child / In NASA Goddard Space Flight Center Telstar I, Vol. 4 Dec. 1965 p 2183-2193 Submitted for Publication (See N67-12301 03-07) CFSTI: HC \$7.48/MF \$2.00

A traveling-wave solid-state maser amplifier, immersed in liquid helium for very low temperature operation, is used to provide the first stage of amplification in the receiving system of a communication-satellite earth station. A large vacuum pump is required to cause the helium to boil at reduced pressure and thus attain a temperature lower than 2°K to insure the operation of the ruby-crystalline alumina amplifier. The complete helium control equipment associated with the maser operation consists of a vacuum line along and down the aerial structure to the vacuum pump, equipment for controlling the flow of helium gas from the vacuum pump, and a helium storage container for return to the liquefaction plant. G.G.

**N67-12533# General Telephone and Electronics Labs., Inc., Bayside, N. Y. Bayside Lab.**

**CHELATE LASERS Final Report, 1 Apr. 1963-31 Mar. 1966**

A. Lempicki, H. Samelson, C. Brecher Apr. 1966 125 p refs (Contract Nonr-4134(00); ARPA Order 306; Proj. Defender) (TR-66-052.13; AD-632178)

The physical properties and operating characteristics of chelate laser systems are defined. The limitations of chelate solutions in such systems are described in terms of the chemical behavior of the component materials, and the chemical and spectroscopic

properties of the chelates themselves are elucidated. Approaches for overcoming the intense absorption which limits the performance of chelate lasers are proposed. The document is comprised largely of reprints from the following sources: J. Chem. Physics V40 P2547-2553, P2553-2558 1964; J. Chem. Physics V42 P1081-1096 1965; J. Chem. Physics V41 P1214-1224 1964; J. Chem. Physics V41 P279-280 1964; Applied Physics Letters V2 P159-161 1963; Nature V202 P580-581 1964; J. Chem. Physics V41 P3998-4000 1964; Applied Physics Letters V5 P173-174 1964; Applied Optics Suppl. 2 of Chemical Lasers P205-213 1965. TAB

**N67-12645# Naval Research Lab., Washington, D. C.**

**NRL PROGRESS IN HIGH-POWER LASER RESEARCH Interim Report**

10 Jun. 1966 44 p refs

(ARPA Order 660)

(NRL-6444; AD-637616) CFSTI: HC\$2.00/MF\$0.50

**CONTENTS:**

1. LASER MATERIALS RESEARCH H. W. Gandy, R. J. Ginther, and J. F. Weller p 1-13 refs (See N67-12646 03-26)

2. LASER MATERIALS EVALUATION PROGRAM W. H. Vaughan p 14 (See N67-12647 03-26)

3. MAGNETIC Q-SPOILING OF COOLED RUBY J. N. Bradford, J. W. Tucker, and R. C. Eckardt p 15-18 ref (See N67-12648 03-16)

4. GAS LASER RESEARCH A. W. Ali (Catholic Univ. of Am.), J. D. Shipman, A. C. Kolb, and A. D. Anderson p 19-24 refs (See N67-12649 03-16)

5. BEAM SELF-FOCUSING IN LIQUIDS E. A. Mclean p 25 refs (See N67-12650 03-16)

6. HIGH-POWER LASER DEVELOPMENT J. M. McMahon and B. G. Bricks p 26-29 refs (See N67-12651 03-16)

7. FLASHLAMP SPECTROSCOPY F. D. Harrington p 30-38 ref (See N67-12652 03-23)

**N67-12646# Naval Research Lab., Washington, D. C.**

**LASER MATERIALS RESEARCH**

H. W. Gandy, R. J. Ginther, and J. F. Weller / In its NRL Progr. in High-Power Laser Res. 10 Jun. 1966 p 1-13 refs (See N67-12645 03-16) CFSTI: HC\$2.00/MF\$0.50

The main effort in laser materials research was directed toward the study of energy transfer in double and triple activated glasses, its manifestations in stimulated emission processes, and equipment development for these studies. Sequential two-step energy transfer was found in a barium crown glass matrix from UO<sub>2</sub><sup>+</sup> to Nd<sup>3+</sup> to Yb<sup>3+</sup> and established the necessity of a bridging ion. Both sequential and parallel radiationless energy transfer was observed in a lithium magnesium aluminosilicate glass. Stimulated emission processes in multiple activated glass etalons were observed in the Yb<sup>3+</sup> to Ho<sup>3+</sup> transfer laser; as much as a tenfold decrease in the Ho<sup>3+</sup> laser threshold was found with the incorporation of Yb<sup>3+</sup> in the etalon glass. Larger bursts of oscillations from glass etalons were produced by introducing a recoverable loss in the etalon itself; self Q-switching stimulated emission outputs of Er<sup>3+</sup>, Yb<sup>3+</sup>, Nd<sup>3+</sup>, and Ho<sup>3+</sup> by utilizing saturable absorption at the respective wavelengths. The simplest type of self Q-switching was observed in silicate glass singly activated with Er<sup>3+</sup> at 80°K. Self-Q-switching of Nd<sup>3+</sup> stimulated emission was found in Ce<sup>3+</sup>, Nd<sup>3+</sup> activated etalons at low temperatures after the etalon had been exposed to uv radiation. G.G.

**N67-12647# Naval Research Lab., Washington, D. C.**

**LASER MATERIALS EVALUATION PROGRAM**

W. H. Vaughan / In its NRL Progr. in High-Power Laser Res. 10 Jun. 1966 p 14 (See N67-12645 03-16) CFSTI: HC\$2.00/MF\$0.50

Described is the assembly of equipment to measure the static scattering loss of materials intended for high-powered lasers. The method that is being used involves placing the sample in an integrating sphere; light from the sample is then compared to a known light source. A photomultiplier in conjunction with a phase-sensitive detector is utilized as a null instrument. G.G.

**N67-12648#** Naval Research Lab., Washington, D. C.  
**MAGNETIC Q-SPOILING OF COOLED RUBY**

J. N. Bradford, J. W. Tucker, and R. C. Eckardt *In its* NRL Progr. in High-power Laser Res. 10 Jun. 1966 p 15-18 ref (See N67-12645 03-16) CFSTI: HC\$2.00/MF\$0.50

Q-switching of a well-pumped ruby laser was initiated by the triggering of a spark gap discharge of a 2- $\mu$ F capacitor charged to 20,000 V. This fast discharge opposed the relatively slow magnetizing current so that the net coil current went down to zero and reversed in polarity. Several oscillograms were made showing the Q-switched output with the end faces of the ruby serving as the cavity mirrors. G.G.

**N67-12649#** Naval Research Lab., Washington, D. C.  
**GAS LASER RESEARCH**

J. D. Shipman, A. C. Kolb, A. D. Anderson, and A. W. Ali (Catholic Univ. of Am.) *In its* NRL Progr. in High-Power Laser Res. 10 Jun. 1966 p 19-24 refs (See N67-12645 03-16) CFSTI: HC\$2.00/MF\$0.50

Described is an experimental gas laser system atop a water dielectric capacitor that is able to study gas lasers at higher currents and current densities than usual. The system uses demineralized water as an insulator for the 2- $\mu$ sec charge involved; the water dielectric capacitor is pulse charged through a step-up transformer to a peak current of 150 kA at 300 kV. Aluminum concave mirrors and quartz windows insure a wide spectral range output. Lasing was observed with argon, neon, and mixtures of argon, neon, and air. About equal parts of argon and dry air at a pressure of 0.02 torr gave about 0.5 watt output in the visible at 4765 Å. The greatest output was 5 to 10 W, obtained in the ultraviolet at 3511 Å. A high power nitrogen laser of about 30 torr was obtained by a 180 cm long discharge channel with electrode spacing of 1.7 cm. A computer program was written for a laser system with up to five energy levels and the equations governing the population densities of the upper and lower levels of the lasing line are presented. G.G.

**N67-12650#** Naval Research Lab., Washington, D. C.  
**BEAM SELF-FOCUSING IN LIQUIDS**

E. A. Mc Lean *In its* NRL Progr. in High-Power Laser Res. 10 Jun. 1966 p 25 refs (See N67-12645 03-50) CFSTI: HC\$2.00/MF\$0.50

Spatial changes in the refraction index as a function of time when an intense light beam passes through a liquid were observed. Time-integrated photographs taken of a giant laser pulse ( $\approx 150$  MW) traveling through a water cell showed evidence of self-focusing and trapping for the light beam. G.G.

**N67-12651#** Naval Research Lab., Washington, D. C.  
**HIGH-POWER LASER DEVELOPMENT**

J. M. Mc Mahon and B. G. Bricks *In its* NRL Progr. in High-power Laser Res. 10 Jun. 1966 p 26-29 refs (See N67-12645 03-16) CFSTI: HC\$2.00/MF\$0.50

The principle of the Faraday Q-switch for high power laser output is discussed and experimental results with a Faraday-active material are reported. A vertically polarized light beam output from a 60-degree-cut ruby was reflected from quartz plates at Brewster's angle when there was no magnetic field present; a 90 degree rotation of the plane of polarization of the ruby laser in the Faraday-active material by pulsed magnetic field resulted in a giant pulse and eliminated any reflection loss. G.G.

**N67-12652#** Naval Research Lab., Washington, D. C.  
**FLASHLAMP SPECTROSCOPY**

F. D. Harrington *In its* NRL Progr. in High-Power Laser Res. 10 Jun. 1966 p 30-38 ref (See N67-12645 03-16) CFSTI: HC\$2.00/MF\$0.50

Described is an external optical system for time-resolved spectroscopic studies of pulsed flash lamps that might be used as laser pumps. The spectrograph was made time-resolving by a gas-driven rotating plane mirror, positioned ahead of the 20-mm entrance slit, to sweep the image along the slit. A beam splitter in the external optical system allows a monochromator to observe photoelectric intensity and time duration of a single pulse from the flashlamp as well as the spectral radiance versus wavelength. The current as a function of time is displayed on an oscilloscope along with the monochromator pulse. A complete study of the a 103-0 spectroscopic film and instrumentation calibration from 3300 to 5000 Å was made, and a method for data reduction from time-resolved spectrographs was developed. G.G.

**N67-13061#** Advisory Group for Aerospace Research and Development, Paris (France).  
**OPTOELECTRONIC COMPONENTS AND DEVICES**

Sep. 1965 461 p refs Proc. of the 9th Meeting of the AGARD Avionics Panel, Held in Paris, 6-9 Sep. 1965 (AGARD-CP-5) CFSTI: HC\$5.11/MF\$2.00

Articles on electro-optical devices and techniques in communications, instrumentation, guidance, radar, and other areas of application are presented. For individual titles see N67-13062-N67-13084.

**N67-13063#** Radio Corp. of America, Princeton, N. J. RCA Labs.

**LASERS FOR DIGITAL DEVICES**

Walter F. Kosonocky (Ph.D. Thesis-Columbia Univ.) *In* AGARD Optoelectron. Components and Devices Sep. 1965 p 23-77 refs (See N67-13061 03-23) CFSTI: HC\$5.11/MF\$2.00 (Contract AF 30 (602)-3169)

Continuously pumped lasers are considered as components for digital circuits in which all of the processing signals are in the form of optical energy. The operation of the laser digital circuits is based on signal gain derived from a laser amplifier and nonlinear (saturable) response of optical materials to laser signals. The two nonlinear processes are quenching of the output of a laser oscillator and saturation of optical absorption. A laser inverter, a laser bistable oscillator, and a laser monostable oscillator are examined as switching devices that could be implemented with GaAs lasers. The GaAs laser inverter is further evaluated as a general-purpose switching circuit, and experimental tests of the operation of this device are reported. The operation of a laser relaxation oscillator and a laser monostable circuit was demonstrated experimentally with ruby lasers having inside their resonant cavities, solutions of phthalocyanine as the saturable absorbers. A digital signal gain of two was achieved in the test of the ruby monostable circuit.

Author

**N67-13064#** Siemens and Halske A. G., Munich (West Germany). Central Labs.

**OPTICAL PULSE AMPLIFIERS WITH ACTIVE SATURABLE ABSORPTION SWITCHES**

Dieter Roess *In* AGARD Optoelectron. Components and Devices Sep. 1965 p 79-90 refs (See N67-13061 03-23) CFSTI: HC\$5.21/MF\$2.00

A laser oscillator, whose resonator is blocked by a saturable filter, is a bistable device. Saturation of the filter by an external optical device will switch the oscillator "on". By using systems with more than one resonator, the oscillator can be switched off by one signal at one port, and on by another signal at another port. The light components can be combined with electro-optic input and output. Basic elements and more complex configurations are

described. Transients of the order of  $10^{-11}$  seconds will be possible, using semiconductor elements. High sensitivity is achieved by using filters, whose saturation is frequency-selective. Experiments with selectively saturable substances are described. Author

**N67-13069#** Spectra-Physics, Inc., Mountain View, Calif.  
**LOW POWER, WIDE BANDWIDTH LASER MODULATORS**  
 James L. Hobart /In AGARD Optoelectron. Components and Devices Sep. 1965 p 165-177 refs (See N67-13061 03-23)  
 CFSTI: HC\$5.11/MF\$2.00

Recent advances in electro-optic modulators now permit large modulation bandwidths at low driving voltages. Present emphasis centers on three classes of devices: temperature compensated transverse Pockel's effect type, the multiple-cell type using the longitudinal Pockel's effect, and the room temperature paraelectric perovskites. The physical principles of each of these devices are reviewed and their present state of development summarized. Examples of the application of these devices to optoelectronic systems are given. Author

**N67-13073#** Perkin-Elmer Corp., Norwalk, Conn.  
**COHERENT OPTICAL SIGNAL PROCESSORS**  
 Eugene C. La Vier /In AGARD Optoelectron. Components and Devices Sep. 1965 p 237-249 refs (See N67-13061 03-23)  
 CFSTI: HC \$5.11/MF \$2.00

A coherent optical signal processor is an electro-optic device that makes use of coherent sources and diffraction phenomena to perform filtering, multiplication, spectral analysis, and combinations of these to do autocorrelation, and cross-correlation. Optical signal processors have two essential advantages; the optical system is by its nature two-dimensional, and extremely high processing gain is possible due to high resolution capability of diffraction limited optics. The implications of these advantages on performance as related to several applications, are discussed. An optical processor consists of a laser, collimating optics, an input signal transducer, and additional optics for transforming the spatially distributed signal into its Fourier transform and imaging this on a reference plane and for collecting the signal for the output transducer. The effect of each of these elements on the processor performance is discussed, along with the practical level of performance that may presently be expected from these elements. Several possible applications of optical signal processors are included. Author

**N67-13079#** Raytheon Co., Bedford, Mass. Missile Systems Div.  
**OPTOELECTRONIC AIRCRAFT ALTIMETER**  
 James E. Hopson /In AGARD Optoelectron. Components and Devices Sep. 1965 p 329-343 refs (See N67-13061 03-23)  
 CFSTI: HC\$5.11/MF\$2.00

The basic optoelectronic components, consisting of an electron injection laser diode, an optical transmission medium, and a silicon photodetector, have been adapted to the purpose of determining aircraft height during landing. The height determination is made on the basis of the transit time required for a light beam to travel from the laser to the ground and back to the photodetector. Two modes of operation are considered. In the first case a cryogenically cooled injection laser is sine-wave modulated in a continuous manner. The transit time of the light beam may be measured in terms of a shift in the modulation phase between the outgoing and incoming light waves. In the second case an injection laser is pulse modulated at room temperature with a fast rise optical output. A direct measure of the transit time of the light pulse enables a height measurement. In connection with these modes of operation, the latest advances in electron injection lasers and photodiodes will be discussed. The advantages and disadvantages of the optoelectronic technique relative to other techniques are also discussed. Author

**N67-13108\*#** Miami Univ., Coral Gables, Fla. School of Environmental and Planetary Sciences.  
**RESEARCH IN ATMOSPHERIC MEASUREMENT TECHNIQUES Semiannual Report**  
 S. Fred Singer Nov. 1966 27 p ref  
 (Grant NGR-10-007-028)  
 (NASA-CR-80473) CFSTI: HC\$2.00/MF\$0.50 CSCL 04A

A systems analysis optimization of a laser experiment designed to detect interplanetary dust in the earth's atmosphere was completed, and a concise summary of the results are given. The analysis indicates that a light-collecting mirror with a diameter of 40 or more inches would be of great benefit, and efforts are being made to obtain such a mirror. The analysis statistics together with given atmospheric scattering cross section data indicate that atmospheric density and atmospheric density changes can be measured by the laser technique. A conceptual plan, based on the Ruby laser and a Raman shifter, for measuring the atmospheric surface pressure by means of a laser from a meteorological satellite was devised. A zodiacal model concerning the interplanetary dust influx into the earth's atmosphere is described, and a summary of distribution functions for zodiacal dust is given. In addition, equations and system parameters for a systems study of a laser atmospheric backscatter experiment are updated and evaluated, and compared to earlier analyses. L.S.

**N67-13120\*#** Miami Univ., Coral Gables, Fla. School of Environmental and Planetary Sciences.  
**REPORT ON LASER BACK-SCATTER SYSTEM AND SUBSYSTEMS Semiannual Status Report**  
 Luis M. Herrera-Cantilo Nov. 1966 46 p refs  
 (Grant NGR-10-007-028)  
 (NASA-CR-80441) CFSTI: HC\$2.00/MF\$0.50 CSCL 20E

A laser system used for backscattering experiments, is described in detail. The transmitter; the fluorescence shutter; the receiving telescope and optical receiver; the high speed shutter; the detector and detector housing; the preamplifier; the video amplifier and threshold detector; and the timing and display units are described. Also discussed are the transmitter output, and the operation of the timing unit. A procurement time schedule for the project; and circuit diagrams of the various parts of the system are given. L.S.

**N67-13488#** New York Univ., N. Y.  
**SOME OBSERVATIONS OF THE VERTICAL PROFILE OF WATER VAPOR BY MEANS OF A LASER OPTICAL RADAR**  
 Richard M. Schotland /In Mich. Univ. Proc. of the 4th Symp. on Remote Sensing of Environment Jun. 1966 p 273-283 refs /In Geophys. Sci. Lab. Contrib. 41 (See N67-13461 04-14)  
 CFSTI: HC\$8.75/MF\$3.50  
 (Contract DA-36-039-AMC-03411(E))

The theory of the measurement of the vertical profile of atmospheric water vapor utilizing a thermally tuned ruby laser radar is presented. Calculations of the transfer function and the expected signal to noise ratio for a typical system are given. Spectroscopic results of a thermally tuned laser scan through the 6942.37A and 6942.15A water vapor lines are shown. Measurements of the range integrated water vapor profiles are compared with the range variation of the backscattered laser returned signal. Author

**N67-13665\*#** Stanford Univ., Calif. Microwave Lab.  
**THEORETICAL AND EXPERIMENTAL INVESTIGATIONS OF COLLECTIVE MICROWAVE PHENOMENA IN SOLIDS Semiannual Status Report, 1 Apr.-30 Sep. 1966**  
 M. Chodorow Dec. 1966 14 p  
 (Grant NGR-05-020-165)  
 (NASA-CR-80727; SASR-1; ML-1493) CFSTI: HC \$1.00/MF \$0.50 CSCL 20L

The following three developments are discussed: (1) experiments in the steady state and transient behavior of freely propagating, high field dipole domains in n-type GaAs. Results showing the variation of domain voltage and charge as a function of field external to the domain are presented. Discussed are also the propagation constant and growth rate of small signal space charge waves in high resistivity GaAs, where domain formation is impossible. (2) electroacoustic amplifiers to operate in the microwave frequency ranges. Fabricating techniques were developed for miniature sandwich type structures in which the various layers consist of electroacoustic transducers, thin film electrical contacts, and the active amplifier material. (3) analyses and calculations of electronic deflection of the direction of a laser beam. It is proposed to utilize the Brillouin scattering process and the frequency of an acoustic wave which is excited in a crystal to control the optical beam direction. K.W.

**N67-13686** Radio Corp. of America, Camden, N. J.  
**LASER MEASUREMENT OF ELECTRON DENSITY IN DENSE, HIGH-TEMPERATURE PLASMA**  
 A. Boornard, L. J. Nicastro, and James Vollmer *In its Plasma Phys. Res. and Eng.* 1966 p 26-30 refs (See N67-13681 04-25)

Temperatures in the range of 14,000° to 16,000°K are attainable in the potential core region of an argon plasma jet operating in the laminar mode. Measurement of the electron concentration in such high temperature plasma by conventional probe and microwave techniques is extremely difficult. The use of laser interferometer techniques appears to be promising, and electron concentration measurements obtained using a HeNe two-cavity laser interferometer are presented. Use is made of the 3.39- $\mu$ m radiation to obtain a large phase shift: the visible 6328-angstrom radiation is used for alignment and detection. The effects of scattering of the laser radiation by the plasma jet when operated in the turbulent mode are also reviewed. Author

**N67-13974#** Westinghouse Electric Corp., Pittsburgh, Pa. Research Labs.  
**HIGH TEMPERATURE PLASMAS BY LASER HEATING**  
**Final Report**

E. W. Sucov, J. L. Pack, A. V. Phelps, and A. G. Engelhardt 6 Apr. 1966 67 p refs Submitted for Publication  
 (Contract AT(31-1)-3472)  
 (TID-22928) CFSTI: HC\$3.00/MF\$0.75

Studies were made of the confinement in a magnetic mirror of a plasma produced by focussing a Q-switched laser beam on aluminum targets in the form of disks, foils, and spheres. High speed photographs show that one component of the plasma generated from flat targets is asymmetric and moves toward the laser with a velocity of about  $10^7$  cm/sec. The plasma generated from ball targets is roughly symmetrical with respect to the origin and expands much more slowly. In the presence of a mirror magnetic field of ratio 2:1, the expansion velocities are not appreciably reduced. However, the duration of the luminosity from a slower constituent of the plasma is increased by a factor of about 5, i.e., from 1  $\mu$ sec to about 5  $\mu$ sec, indicating that some confinement has occurred. In addition, microwave interferometer measurements show the confinement of a slow component of the disk plasma in the magnetic field with an electron density of about  $5 \times 10^{11}$  cm<sup>-3</sup> at times as late as 50  $\mu$ sec. Electrostatic probes provide an independent verification of the maximum expansion velocity which corresponds to an ion kinetic energy of about 1.4 KeV. Time integrated spectra of the plasma show lines from excited states of doubly ionized aluminum. Microwave attenuation measurements lead to an apparent electron temperature of the order of 0.02 eV at times later than 1  $\mu$ sec. Analysis of microwave and other data show that radial density gradients probably exist in some plasmas. Author (NSA)

**N67-14212\*#** Ohio State Univ. Research Foundation, Columbus. Dept. of Electrical Engineering.

**INVESTIGATION OF A FEW SIMPLE MOLECULAR GASES AS A POSSIBLE MOLECULAR LASER MATERIAL**

Peter K-L Yin and Said H. Koozekanani 1 Nov. 1966 22 p  
 (Grant NsG-74-60)

(NASA-CR-80832; Rept.-1093-31) CFSTI: HC \$1.00/MF \$0.50  
 CSDL 20E

Some mechanisms of inversion are discussed, and a review, in tabular form, is presented on some of the simple molecular gases which have energy levels close to the vibrationally excited metastable level ( $v=1$ ) of  $N_2$ . It is pointed out that the vibrational level of  $N_2$  is about 2330 cm<sup>-1</sup> above the ground level and is a metastable state. Because of its long lifetime, it is considered a suitable gas for transferring its energy to other gases being in resonance with it. M.G.J.

**N67-14307#** Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Groupe de Recherches sur la Fusion.

**1965 ACTIVITY REPORT OF THE RESEARCH GROUP FOR CONTROLLED FUSION [RAPPORT D'ACTIVITE DU GROUPE DE RECHERCHES POUR L'ANNEE 1965]**

277 p refs In FRENCH Prep. in Assoc. EURATOM  
 (EUR-CEA-FC-352) CFSTI: HC\$6.00/MF\$1.50

Progress has been made in theoretical plasma description, especially of instabilities, and experimental studies of phenomena e.g. interactions with beams and the electrical breakdown of a gas with a laser. In the field of magnetic mirrors and ion injection the stability of a plasma MM II was observed at a density where similar experiments reveal instabilities. Experiment DECA II confirmed the stability of magnetic wells, giving rise to the problem of causes that restrict the life of a plasma in a stable configuration. In the field of toroidal plasma it has been found out that the conditions of stability of the toroidal tubular pinch were essentially the same as in cylindrical geometry. The disclosure of the gravity of instability bound to the density gradient in mirror machines is very important for the program at Fontenay where magnetic mirrors play the first role. A project DECA III is investigated to observe experimentally the principal confinement limitation in a stable configuration from a magnetodynamic point of view. ESRO

**N67-14312#** Library of Congress, Washington, D. C. Aerospace Technology Div.

**SOVIET QUANTUM ELECTRONICS RESEARCH Surveys of FOREIGN SCIENTIFIC AND TECHNICAL LITERATURE**

Yuri Ksander 2 Aug. 1966 124 p refs Comprehensive Rept.  
 (ATD-66-97)

A statistical review of Soviet facility-personality activity in quantum electronics research is presented. The review is divided into sections, each covering the work of a particular research institute, laboratory, or university. The review sections are followed by 634 references to all retrieved sources. The references are arranged in the order in which they are discussed in the sections and are keyed to the appropriate section by letter designation. An attempt is made to show the association of the research teams or groups with their subject of specialization and also to show changes that have occurred in Soviet laser research since Sept 1964. Such changes include shifts in subject areas of interest, volume of work in a given area, and personnel engaged in a given study. The appendices include a subject-facility distribution, the percentage of total retrieved articles by facility and by subject, and an author index. R.N.A.

**N67-14331#** Army Electronics Labs., Fort Monmouth, N. J.  
**INTERFEROMETRIC PHOTOGRAPHIC TECHNIQUES FOR RECORDING OPTICAL PATH LENGTH VARIATIONS IN PUMPED LASER RODS**



Charles J. Bickart Aug. 1966 28 p refs  
(ECOM-2751; AD-640439) CFSTI: HC\$2.00/MF\$0.50

The report describes some unique photographic techniques developed during an investigation of thermal effects occurring in solid-state laser materials (Nd+++ glass and ruby) during the pumping period. An experimental approach is described for the investigation of the interaction of a high energy laser beam with the atmosphere. Two novel high-speed cameras designed specifically for these investigations are discussed in detail. Experimental results are shown from which conclusions concerning optimum pumping arrangements, rod characteristics, and doping concentrations can be drawn. Author (TAB)

**N67-14441\*#** Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.  
**MICROWAVE MASER DEVELOPMENT: EXTENSION OF KYLSTRON TUNING RANGE**

R. Clauss *In its* Space Programs Sum. No. 37-41, Vol. III 30 Sep. 1966 p 78-81 refs (See N67-14421 05-07) CFSTI: HC\$4.25/MF\$1.50

The slow wave comb structures of two new tunable traveling wave masers were designed and loaded to give a tuning range which covers both 2295 and 2388 Mc. When the signal frequency is changed, the pump klystron frequency must also be changed. An external over coupled cavity is used with the pump klystron to extend its electronic tuning range. No mechanical adjustments at the maser package are necessary when the signal frequency is tuned to either 2295 or 2388 Mc. This frequency change may be accomplished entirely from the maser instrumentation rack. R.N.A.

**N67-14628\*#** Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics

**PLASMA PHYSICS**

J. C. Ingraham, G. Lampis, and R. L. Kronquist *In its* Res. Lab. of Electron. 15 Oct. 1966 p 37-58 refs (See N67-14621 05-34) CFSTI: HC\$6.00/MF\$1.25  
(Contract AT(30-1)-1842)

The following three studies are discussed: (1) Calculated was an ion-wave instability that can occur in a steady-state discharge in which no electric current exists. It was assumed that all other plasma instabilities are absent, that the plasma is weakly ionized, and that electron-ion collisions are negligible. (2) A laser breakdown experiment was conducted to determine the transmission rate of the gas laser power (HeNe) through the plasma. The purpose was to gain knowledge of the absorption coefficient of the light at 6328 Å and to measure the dimensions of the plasma during its evolution in time. The pulse from the ruby laser was stabilized to the power of 50 MW (2 J in 40 nsec). The gas was helium at 10.25 kg/cm<sup>2</sup> pressure. (3) Experiments were conducted to observe microwave scattering from density fluctuations in a plasma produced by firing an electron beam into un-ionized mercury vapor. Evidence indicated that the scattering is from plasma waves, excited by the electron beam, which reflect from the ends of the plasma column and form standing waves along the axis of the tube. K.W.

**N67-14893\*#** Syracuse Univ. Research Corp., N. Y. Electronics Research Lab.

**STABILIZED GAS LASER OSCILLATORS Final Report, 24 Jun. 1964-21 Jun. 1966**

H. Muldoon, I. Bicevskis, and A. Steele 21 Jun. 1966 56 p  
(Contract NAS5-3927)

(NASA-CR-80958) CFSTI: HC\$3.00/MF\$0.65 CSCL 20E

Design, development, fabrication, evaluation, and delivery of two phase-locked, frequency-stabilized gas lasers are discussed. The phase-locking scheme employed utilized the comparison of the frequency of a signal derived from a crystal oscillator to the frequency of the self-beat signal of the laser in order to generate an error signal which would minimize the difference frequency. It

is concluded that these two laboratory prototypes have proven the feasibility and practicality of the phase-locking scheme employed. Author

**N67-15074#** Illinois Univ., Urbana. Dept. of Electrical Engineering.

**JUNCTION EFFECTS IN COMPOUND SEMICONDUCTORS Status Report No. 6**

N. Holonyak, Jr., M. D. Sirkis, M. R. Johnson, J. S. Moore, and G. Stillman Jun. 1966 12 p refs  
(Contract AF 19(628)-4337)

(AFCRL-66-617; AD-642342) CFSTI: HC\$3.00/MF\$0.65

The effect of the considerable depth of donor impurity states near the indirect <100> conduction band minima on the direct-indirect transition in Ga(AsP) is discussed. A simple technique for using a Ga(As-P) laser to operate a CdSe laser is described. The current understanding of the P-I-N deep-level oscillator is mentioned. Author (TAB)

**N67-15088#** Edgerton, Germeshausen and Grier, Inc., Bedford, Mass.

**DESIGN STUDY OF ADVANCED GEODETIC LASER SYSTEM Interim Scientific Report**

Sumner Ackerman 30 Sep. 1966 88 p refs

(Contract AF 19(628)-5516)

(AFCRL-66-731; SR-1; B-3417; AD-642153) CFSTI: HC\$3.00/MF\$0.65

The geodetic laser system described herein is to generate two intense beams of radiant energy so that a portion reflected from an assembly of retrodirective reflectors on a satellite can produce a detectable and identifiable point image on a photographic plate and an unambiguous photoelectric voltage pulse. The photographic image, taken against a calibrated stellar background, will be used to measure the angular position of the satellite, and the photoelectric signal to measure its slant range. These measurements will be made almost simultaneously and together establish the vector displacement between the ground-based laser system and the satellite at the time of observation. The distance to the satellite is generally more than 1000 km. The desired accuracies of the angular and range measurements are to less than 2 arc-seconds and to less than 10 meters respectively. Multiple observations will be made in each orbital pass to enhance identification of the photographic image and collect more data. The requirements and specifications for all major system components are established so that a reasonable compromise between desired performance and costs will be achieved. Design is carried out in detail only to the point of assurance that technological state-of-the-art exists which is consistent with the system requirements and the specifications. Author (TAB)

**N67-15107#** Union Carbide Corp., East Chicago, Ind. Crystal Products Dept.

**PRODUCTION ENGINEERING MEASURE FOR RUBY LASER RODS Quarterly Progress Report, Jan. 1-Mar. 31, 1966**

M. K. Towne and R. L. Hutcheson 31 Mar. 1966 32 p refs  
(Contract DA-36-039-AMC-06168(E))

(QPR-3; AD-642289) CFSTI: HC\$3.00/MF\$0.65

Single variable studies of standoff and gas flows have indicated definite optimum ranges. Boule diameter has an effect on boule quality but is not an independent variable. Furnace chamber diameter affects quality but growth is very difficult in the range where best quality was achieved. Initial multi-variable studies indicated an advantage for pulsed powder feed but other factors should be checked before drawing a definite conclusion. Author (TAB)

**N67-15240#** Imperial Coll. of Science and Technology, London (England). Plasma Physics Group.

**LASER INTERFEROMETER MEASUREMENTS OF RAPID ELECTRON DENSITY CHANGES IN A PLASMA**

C. B. Wheeler and A. E. Dangor /In AGARD Fundamental Studies of Ions and Plasmas, Vol. II 1965 p 517-527 ref (See N67-15234 05-25) CFSTI: HC \$7.00/MF \$1.75

A He-Ne laser was constructed and used with various types of interferometer to measure plasma electron density. Particular emphasis was given to the time resolution of the interferometers since in nearly all experimental plasmas density variations take place with extreme rapidity. In a series of preliminary experiments it was found that a modified Mach-Zehnder interferometer was the fastest system; it could measure path differences about 10 times as rapidly as the corresponding Fabry-Perot arrangements. Results of density measurements using a modified Fabry-Perot system are presented as a function of time for a range of discharge parameters. At very high number densities the fringes disappeared. The disappearance has been shown to be due to refraction of the laser beam in the plasma due to radial electron density gradients. The long plasma length in these experiments made this a significant effort, but short lengths of uniform plasma can avoid this limitation. Author

**N67-15241#** Illinois Univ., Urbana. Gaseous Electronics Lab. **PLASMA DIAGNOSTICS WITH GASEOUS LASERS**

J. T. Verdeyen and J. B. Gerardo /In AGARD Fundamental Studies of Ions and Plasmas, Vol. II 1965 p 529-572 refs Sponsored by Army (See N67-15234 05-25) CFSTI: HC \$7.00/MF \$1.75

The basic principles of the three-mirror laser interferometer as applied to plasma diagnostics are reviewed. It was shown that the spherical laser interferometer is capable of nearly two orders of magnitude greater sensitivity than the plane parallel system. It was also shown that the high sensitivity of the spherical laser interferometer can be used while preserving the spatial resolution if the plasma is located in the laser cavity. The plasma changes the laser frequency and the reference cavity performs the function of a frequency sensitive reflector. Using this technique, the system has been made 27 times more sensitive than the plane-parallel case while sampling a plasma cross section of less than 1 mm<sup>2</sup>. One limitation of the laser interferometer was the frequency response. However, resonances in excess of 50 per microsecond can be detected by sampling the fields in the reference modulation between the coherent laser radiation and the incoherent sidelight emitted by the gas laser system. Author

**N67-15312#** Sylvania Electric Products, Inc., Mountain View, Calif. Electronic Defense Labs.

**TECHNIQUES FOR SUPER-MODE OSCILLATION** Interim Engineering Report, 1 Jul.-30 Sep. 1966

Russell Targ and J. M. French 30 Sep. 1966 36 p refs (Contract AF 33(615)-2884)

(IER-5; AD-640143) CFSTI: HC \$2.00/MF \$0.50

Construction of an automatic frequency control system for the absolute frequency stabilization of our 2-meter long, 50 mw FM laser was completed. The FM laser produces an error signal which increases as the laser frequency drifts with respect to the center of the Doppler-broadened fluorescence line. The electrical phase of the error signal changes by 180 degrees as the laser drifts from one side of line center to the other. The servo-system generates a control signal of the appropriate magnitude and sign to move a laser mirror attached to a piezoelectric crystal, and cancels any tendency of the laser frequency to drift from line center. The discontinuous 180-degree change of phase in the error signal at line center was measured. The profile of the extremely sharp discriminant was measured and shown to agree satisfactorily with that predicted by theory. The FM laser controlled by this servo-system was demodulated by means of optical heterodyne

detection by photomixing with a laser of known stability. This photomixing experiment showed that the FM laser is, at present, absolutely stabilized to within 1.5 MHz of line center. Work is now under way to improve this preliminary figure. TAB

**N67-15327#** Hughes Research Labs., Malibu, Calif.

**SELECTIVE ACCESS LASER DISPLAY BEAM POSITIONER** Quarterly Report, 1 Mar.-31 May 1966

J. F. Lotspeich, W. P. Brown, Jr., R. G. Dixon, J. E. Kiefer, R. G. Phelps, Jr. et al Griffiss AFB, N. Y., RADC, Aug. 1966 64 p refs

(Contract AF 30(602)-4097)

(RADC-TR-66-447; QR-1; AD-639968) CFSTI: HC \$3.00/MF \$0.75

The objective of the contract is to investigate, theoretically and experimentally, techniques for achieving a high-speed, two-dimensional deflection of a cw visible laser beam. Specifically, this effort is directed toward meeting the requirements of a selective access laser display beam positioner which is capable of presenting a flexible format and multi-color image for a large screen tactical display in Air Force command and control centers.

Author (TAB)

**N67-15343#** Army Electronics Labs., Fort Monmouth, N. J. **INJECTION LASER DRIVING CIRCUIT FOR HIGH-CURRENT, HIGH-REPETITION-RATE OPERATION**

Rudolph R. Gammarino, Ernst J. Schiel, and Gerald A. Talbot Aug. 1966 21 p refs

(ECOM-2753; AD-640481) CFSTI: HC \$3.00/MF \$0.65

The report describes a high current solid-state pulser that has been developed to drive injection lasers from room-temperature operation. Two basic charging circuits are detailed, and the advantages and disadvantages of each are analyzed. The discharge circuit is described, and the factors in the discharge circuit which determine the peak current and pulse width are investigated. The performance of the various solid-state switching devices, silicon-controlled rectifiers (SCR's), employed in the circuit is also discussed.

Author (TAB)

**N67-15746\*#** Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena **OPTICAL COMMUNICATIONS ELEMENTS: SIMULATED ATMOSPHERE**

W. H. Wells /In its Space Programs Sum. No. 37-41, Vol. IV 31 Oct. 1966 p 209-212 (See N67-15701 06-11) CFSTI: HC \$3.00/MF \$0.65

Simple statistical models have been used in a computer program to simulate loss of coherence in order to estimate the effect of the atmosphere on a laser receiver. The random variable being considered is the peak light intensity at any point in the blurred focal point of a large aperture telescope. Resulting data were used to plot contour maps of the focal patterns for arbitrary but equally spaced units of intensity near the peak values. A.G.O.

**N67-15769#** Library of Congress, Washington, D. C. Aerospace Technology Div.

**AN INFRARED BEAM LASER [PUCHKOVYY KVANTOVYY GENERATOR INFRAKRASNOGO DIAPAZONA]** Translations of Foreign Scientific and Technical Literature

N. G. Basov, A. I. Orayevskiy, and V. A. Shcheglov 12 Aug. 1966 7 p refs Transl. into ENGLISH from Zh. Eksperim. Teor. Fiz. (Moscow), v. 4, no. 2, 1966 p 61-62

(ATD-66-102)

The possibility of producing a thermally excited infrared beam laser is discussed. The thermal pumping is based on the possibility of selecting those energy levels of a molecule E<sub>j</sub> molecular beam would be emitted into a vacuum where the temperature of

radiation equilibrium is considerably lower  $(E_\beta - E_\alpha)/k$ . Due to spontaneous emission, level  $\alpha$  is rapidly depleted, and a population inversion can occur for the transition  $\beta \rightarrow \alpha$ . The necessary condition for obtaining population inversion between levels  $\beta$  and  $\alpha$  standpoint of the proposed method is 3–20  $\mu$ . For shorter wavelengths the excited state lifetimes are too short, and for longwave transition, the excited state lifetimes become too long (making instrument dimensions excessively large). An energy level diagram of vibrational levels of the  $\text{CO}_2$  molecule suitable for obtaining population inversion in the molecular beam, is given. Similar transitions in the  $\text{N}_2\text{O}$  and  $\text{HCN}$  molecules are described. L.S.

**N67-15908\*#** Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.  
**FREQUENCY GENERATION AND CONTROL: ATOMIC HYDROGEN FREQUENCY STANDARD**

W. H. Higa *In its Space Programs Sum. No. 37-42, Vol. III* 30 Nov. 1966 p 24–25 (See N67-15901 06-07) CFSTI: HC \$3.00/MF \$0.65

Reported is the design of a dual channel traveling wave maser which will be integrated into a closed-cycle refrigerator. System specifications are briefly described and an illustration of the assembly is included. S.C.W.

**N67-15913\*#** Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.  
**LOW NOISE RECEIVERS: MICROWAVE MASER DEVELOPMENT**

S. M. Petty and R. C. Clauss *In its Space Programs Sum. No. 37-42, Vol. III* 30 Nov. 1966 p 42–46 (See N67-15901 06-07) CFSTI: HC \$3.00/MF \$0.65

The construction of a traveling wave maser (TWM) for use at 8448 MHz is reported. The maser provides a net gain of 41.5 db when installed in a closed-cycle helium refrigerator operating at 4.4°K, and provides more than 30 db net gain over a tunable range of 140 MHz. An equivalent input noise temperature of approximately 18°K has been measured. Data on the maser structure, the complete maser package, and performance characteristics; are included. S.C.W.

**N67-16009\*#** National Academy of Sciences–National Research Council, Washington, D. C.  
**RADIO ELECTRONICS**

*In its Progr. in Sci. Radio* 1966 p 347–371 (See N67-16001 06-34) CFSTI: HC \$3.00/MF \$0.65

Studies on low-noise devices covered the following topics: (1) *Low-Noise Parametric Amplifiers*—development of maser-like amplifiers, broadband amplifiers, and amplifier cooling by incorporation of closed-cycle refrigerators; (2) *Nonlinear Optics and Laser Radar*—nonlinear optical and optical-frequency conversion, laser radar systems, red response of photoelectric detectors, moon observations by laser optics, and laser measurements of high voltage current transmission lines; (3) *On Continuous-Wave Lasers, Gas Lasers, and Holography*—state-of-art in lasers, and laser application in holography; (4) *Microminiaturization*—advances in microelectronics, silicon monolithic integrated circuits, metal-oxide-silicon field-effect transistors, and thin film circuits; (5) *Solid-State Plasmas, Helicons, and Gunn Effect*—spatial and temporal electromagnetic fluctuations, electromagnetic wave propagation in solid conductors, and negative conductance of electron transfer in strong electric field; (6) *Cryogenic Coils*—superconducting magnet technology, cryogenic environment, and magnet application. G.G.

**N67-16014\*** Maryland Univ., College Park. Dept. of Physics and Astronomy.  
**STUDY OF THE PHYSICS OF LASER RADIATION Progress Report, 15 Oct. 1964–15 Oct. 1966**

C. O. Alley 15 Oct. 1966 97 p refs  
 (Grant NGR-21-002-022)  
 (NASA-CR-81248) CFSTI: HC \$3.00/MF \$0.65 CSCL 20E

**CONTENTS:**

1. CORRELATION EFFECTS IN LASER RADIATION p 2–4
2. SCATTERING FROM FLUCTUATIONS IN OPTICAL MEDIA p 4–9
3. OPTICAL RADAR MEASUREMENT OF MICROMETEORITE DENSITY IN THE UPPER ATMOSPHERE p 9 ref
4. STIMULATED ROTATIONAL RAMAN SCATTERING IN NITROGEN p 10–11 ref
5. PROPAGATION OF SHORT LASER PULSES p 11–12
6. DYNAMICAL COMPUTATION OF PHOTON CORRELATIONS AND COUNTING STATISTICS p 12–13 refs
7. INSTABILITIES AND MODE LOCKING PHENOMENA p 13–14
8. STABLE CW He–Ne GAS LASER p 15 ref
9. LASER RANGING TO OPTICAL RETRO-REFLECTORS ON THE MOON p 16–17
10. OPTICAL RADAR USING A CORNER REFLECTOR ON THE MOON P. L. Bender, J. E. Faller (Joint Inst. for Lab. Astrophys.), R. H. Dicke, D. T. Wilkinson (Princeton Univ.), C. O. Alley et al 3 p (See N67-16015 06-16)
11. OPTICAL RADAR DETECTION OF BACKSCATTERING FROM THE UPPER ATMOSPHERE (75–160 km) P. D. McCormick, S. K. Poultney, U. Van Wijk, C. O. Alley, R. T. Bettinger et al 3 p refs (See N67-16016 06-16)
12. COLD CATHODES FOR POSSIBLE USE IN 6328 Å SINGLE MODE He–Ne GAS LASERS U. Hochuli and P. Haldemann 3 p refs (See N67-16017 06-16)
13. ONSET OF LONG-RANGE ORDER IN A CRITICAL SOLUTION OF MACROMOLECULES J. A. White, J. S. Osmundson, and B. H. Ahn 4 p refs (See N67-16018 06-23)
14. DYNAMICAL COMPUTATION OF PHOTON CORRELATIONS AND COUNTING STATISTICS V. Korenman 31 p refs (See N67-16019 06-23)
15. POLARIZATION AND ABSORPTION EFFECTS ON THE FRAUNHOFER DIFFRACTION PATTERNS OF A CORNER REFLECTOR C. O. Alley, R. F. Chang, D. G. Currie, and M. E. Pittman 26 p refs (See N67-16020 06-23)

**N67-16017\*** Maryland Univ., College Park.

**COLD CATHODES FOR POSSIBLE USE IN 6328 Å SINGLE MODE He–Ne GAS LASERS**

U. Hochuli and P. Haldemann *In its Study of the Phys. of Laser Radiation* 15 Oct. 1966 3 p refs Repr. from Rev. Sci. Instr., v. 36, no. 10, Oct. 1965 p 1493–1494 (See N67-16014 06-16) CFSTI: HC \$3.00/MF \$0.65

Properly dimensioned aluminum cold cathodes promise single mode 6328 Å He–Ne gas laser lifetimes exceeding 3000 h with total gas volumes of only 50 cm<sup>3</sup>. These cathodes are simple, rugged, and require only about 0.5 W for an emission current of 5 mA dc. Beryllium cold cathodes may be even better but more time is needed for their evaluation. Author

**N67-16144#** Harry Diamond Labs., Washington, D. C.  
**GALLIUM ARSENIDE LASER RADAR—PRELIMINARY STUDIES**

William L. Soper Aug. 1966 24 p refs  
 (TM-66-13; AD-640540) CFSTI: HC \$3.00/MF \$0.65

The report discusses preliminary work on room-temperature gallium arsenide laser radar and rangefinding. Experimental results are given for three different laboratory models using receivers of up to 20-in. diameter aperture under daylight conditions. Author (TAB)

**N67-16325#** Stanford Univ., Calif. Microwave Lab.  
**MICROWAVE RESEARCH Quarterly Status Report No. 30, 1**  
**May-31 Jul. 1966**

C. F. Quate et al Aug. 1966 16 p refs  
 (Contract Nonr-225(48))  
 (ML-1464; AD-640032) CFSTI: HC \$3.00/MF \$0.65

A report is given on the following projects: electroacoustic amplifiers, optical maser research, stimulated raman effect, geometrical optics of acoustic waves, oscillations in semiconductors, theory of nonuniform plasmas, bulk instabilities in ferromagnetic metals. TAB

**N67-16339#** Stanford Univ., Calif. Microwave Lab.  
**MICROWAVE RESEARCH Quarterly Status Report No. 29, 1**  
**Feb.-30 Apr. 1966**

R. W. H. Engemann et al May 1966 23 p refs  
 (Contract Nonr-225(48))  
 (ML-1436; AD-640149) CFSTI: HC \$3.00/MF \$0.65

Topics included are: Acoustic wave amplification studies, optical maser research, tunable lasers, geometrical optics of acoustic waves, oscillations in semiconductors, theory of nonuniform plasmas, bulk instabilities in ferromagnetic metals. TAB

**N67-16363#** Eastman Kodak Co., Rochester, N. Y.  
**HIGH ENERGY LASER GLASS MATERIAL TECHNIQUES**  
**Final Report**

Sep. 1966 70 p  
 (Contract DA-01-021-AMC-12642(Z))  
 (AD-640097) CFSTI: HC \$3.00/MF \$0.65

A total of twenty-two new neodymium doped laser glasses were made and compared to the standard Kodak ND-11 silicate based glass. One of these compositions shows promise of having a significantly improved durability under laser action at high energy densities. Several others in certain sizes show improved efficiency. An unwinding technique has also been developed for the fabrication of large laser rods from precast blocks of equal volume, but of much smaller size. Laser rods up to 72 inches were delivered for evaluation to the U. S. Army Missile Command, Redstone Arsenal, Alabama. Author (TAB)

**N67-16633\*#** Ohio State Univ. Research Foundation, Columbus.  
 Dept. of Electrical Engineering.

**A PARAMETER STUDY OF A CARBON DIOXIDE GAS LASER**

D. B. Rensch 15 Nov. 1966 57 p refs  
 (Grant NSG-74-60)  
 (NASA-CR-81332; Rept.-1093.34) CFSTI: HC \$3.00/MF \$0.65  
 CSCL 20E

The problem of defining such parameters as discharge tube width and length, gas flow rate, tube wall temperature, and gas mixtures of a CO<sub>2</sub> gas laser is considered. The pertinent theory on symmetry properties of CO<sub>2</sub> and its use as an amplifying medium for infrared frequencies is presented, along with the techniques for determining the effect the above-mentioned parameters have on laser action. The experimental results showed that the parameters can be defined; therefore some of the guess-work in determining optimum laser action for a CO<sub>2</sub> gas laser can be removed. Also, laser operating frequency, symmetry properties, and amplifying characteristics of CO<sub>2</sub> can be correlated with theory. Author

**N67-16644#** Navy Electronics Lab., San Diego, Calif.  
**THREE-DIMENSIONAL HOLOGRAPHY**

H. E. Morrow and N. F. Dessel 7 Sep. 1966 63 p refs  
 (NEL-1403; AD-643165) CFSTI: HC \$3.00/MF \$0.65

The development of holography is presented, along with a summary of the process, the difficulties, and likely applications.

Three-dimensional holography is emphasized. A detailed description of experimental procedures includes an analysis of reasons for failure. A research hologram is analyzed and some measurements are given. A simplified mathematical model and extensive references are included. Author (TAB)

**N67-16724\*#** National Aeronautics and Space Administration.  
 Marshall Space Flight Center, Huntsville, Ala.

**COMMUNICATION SYSTEMS RESEARCH AT MSFC**

John G. Gregory, Carl T. Huggins, and Paul M. Swindall 1966  
 29 p refs *Its Res. Achievements Rev. Ser. 18*  
 (NASA-TM-X-53535) CFSTI: HC \$3.00/MF \$0.65 CSCL 09F

**CONTENTS:**

1. HYDROGEN MASER RESEARCH ACHIEVEMENTS AT MSFC J. G. Gregory p 1-8 refs (See N67-16725 07-16)
2. DEVELOPMENT OF A SOLID-STATE IMAGE CONVERTER C. T. Huggins p 9-12 (See N67-16726 07-14)
3. PROPAGATION STUDIES P. M. Swindall p 13-18 (See N67-16727 07-07)

**N67-16726\*#** National Aeronautics and Space Administration.  
 Marshall Space Flight Center, Huntsville, Ala.

**HYDROGEN MASER RESEARCH ACHIEVEMENTS AT MSFC**

John G. Gregory *In its Commun. Systems Res. at MSFC* 1966  
 p 1-8 refs (See N67-16724 07-07) CFSTI: HC \$3.00/MF \$0.65

The basic principles and the construction of a hydrogen maser and its potential as a highly stable frequency reference for precision tracking systems are discussed. Improvements in stability and size are presented and future improvements are proposed. Results of measurements of relative frequency stability of two masers and the comparison of a hydrogen maser and a cesium beam are discussed. Also presented is the status of the hydrogen maser program and possible areas of application. Author

**N67-16952#** Air Force Missile Development Center, Holloman AFB, N. Mex. Central Inertial Guidance Test Facility.

**REAL TIME TEM-MODE ANALYSIS OF He-Ne LASERS**

Ferdinand F. Kuhn *In AEDC Proc. of the 13th Ann. AF Sci. and Eng. Symp., Vol. I* 1966 38 p refs (See N67-16941 07-34)  
 CFSTI: HC \$3.00/MF \$0.65

This paper describes a unique device referred to as "Automatic Laser Beam Detector and Real Time Transverse Electro-Magnetic Mode (TEM-MODE) Analyzer" that has the following novel features: (a) It permits the optimal tuning of any continuous wave (CW) laser without exposing the investigator to the dangers of looking directly at the laser beam or its reflection. (b) It avoids possible ambiguities in distinguishing between various TEM-modes by its ability to move by remote control the light sensing pinhole/photo-diode combination with respect to the center of the scanning motion of the laser beam. (c) It allows the continuous observation of laser power output changes as a result of TEM-mode transitions. (d) It permits the continuous observation and the tuning of a CW Laser for optimal purity. Several illustrative examples of actual results are presented. Author

**N67-16953#** Aerospace Research Labs., Wright-Patterson AFB, Ohio.

**LASING POTENTIAL OF II-VI COMPOUNDS**

Donald C. Reynolds *In AEDC Proc. of the 13th Ann. AF Sci. and Eng. Symp., Vol. I* 1966 33 p refs (See N67-16941 07-34) CFSTI: HC \$3.00/MF \$0.65

Compounds prepared from elements of group II and group VI of the periodic table show great promise for laser operation at any wavelength between  $\overline{7772\text{\AA}}$  (CdTe) and  $\overline{3200\text{\AA}}$  (ZnS). Currently

lasers operating at 4900Å (CdS) and 6900Å (CdSe) have been successfully produced. In addition compounds of the solid solutions CdS:Se have successfully demonstrated laser action allowing one to have lasers at any wavelength between 4900Å and 6900Å. The spectral region covered by II-VI compounds is the region in which the highest sensitivity has been achieved for detectors. This increases the potential for many practical applications. Author

**N67-16954#** Air Force Cambridge Research Labs., Bedford, Mass.  
**LASER BRIGHTNESS GAIN AND MODE CONTROL BY COMPENSATION FOR THERMAL DISTORTION**

C. Martin Stickley /In AEDC Proc. of the 13th Ann. AF Sci. and Eng. Symp., Vol. I 1966 31 p refs (See N67-16941 07-34) CFSTI: HC \$3.00/MF \$0.65

Laser rod beam divergence is compensated for by means of an external mirror having a curvature opposite to that induced in the rod. The distortion produced in the rod is described in terms of a ray matrix of a thick lens whose focal length is a function of the input energy to the rod. After compensating an excellent optical quality rod with an external mirror a brightness gain of about 100 was achieved simultaneously with single transverse mode operation (TEM<sub>00</sub>) at pump energies as high as 40% over threshold. This procedure for achieving single transverse mode operation is advantageous since (a) no extra elements are needed in the cavity; (b) the beam divergence is near the diffraction limit for the rod holder; and (c) the TEM<sub>00</sub> mode is not only selected but enhanced in volume, thus increasing the power output in this mode and the mode stability of the laser. Author

**N67-17168\*\*** Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.  
**A TRAVELING WAVE MASER FOR DEEP SPACE COMMUNICATION AT 2295 AND 2388 MHz**

R. C. Clauss 15 Feb. 1967 20 p refs  
 (Contract NAS7-100)  
 (JPL-TR-32-1072) CFSTI: HC \$3.00/MF \$0.65 CSCL 20E

A tunable traveling wave maser has been used for deep space communications at 2295 MHz and for planetary radar at 2388 MHz. Machining techniques that enable a comb-structure maser to be fabricated from a single piece of copper have been developed. Excellent surface finish and close tolerances result in low loss at the signal frequency. Coupling and loading techniques are described. Gain adjustment trim coils are used to trade gain for additional bandwidth. An external overcoupled cavity is used with the pump klystron to provide pump power for operation at a signal frequency of either 2295 or 2388 MHz. The maser operates in a closed-cycle helium refrigerator at 4.4°K, and refrigeration is also used to cool the signal input coaxial transmission line. An in-line quarter-wave thermal short circuit is used to transfer heat from the coaxial center conductor. This has reduced the equivalent input noise temperature of the maser to 5°K. Author

**N67-17169#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**JOURNAL OF APPLIED SPECTROSCOPY Selected Articles**  
 31 Aug. 1966 18 p refs Transl. into ENGLISH from Zh. Prikl. Spektroskopii, Akad. Nauk Belorussk. SSR (Minsk), v. 3, no. 3, 1965 p 225-229, 279-282  
 (FTD-HT-66-310; TT-66-62244; AD-638973) CFSTI: HC \$3.00/MF \$0.65

**CONTENTS:**

1. OPERATION OF A RUBY LASER WITH INCLINED MIRRORS V. L. Broube and V. V. Zaika p 1-9 refs (See N67-17171 07-26)
2. THE MECHANISM OF RADIOLUMINESCENCE OF ALKALI-HALIDE PHOSPHOR CRYSTALS T. A. Soovik p 10-16 refs (See N67-17171 07-26)

**N67-17170#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**OPERATION OF A RUBY LASER WITH INCLINED MIRRORS**  
 V. L. Broube and V. V. Zaika /In its J. of Appl. Spectry 31 Aug. 1966 p 1-9 refs (See N67-17169 07-16) CFSTI: HC \$3.00/MF \$0.65

Features of the operation of ruby laser with flat mirrors inclined at an angle of 3'-10' are investigated. It is shown that the slope of the mirrors causes a shift in the intensity maximum on the mirrors and divergences of the radiation beams to the far edges of the mirrors. Correspondence is then observed between images in the near and far zones for any directions of inclination of the mirrors. Experimental results are compared with theoretical deductions, and conclusions are drawn on the mode composition of radiation. Author

**N67-17274** Baird-Atomic, Inc., Cambridge, Mass.  
**RESEARCH ON CIRCULARLY POLARIZED LASERS AND THEIR USE Final Report**

A. W. Hornig 31 Jul. 1966 70 p refs  
 (Contract AF 49(638)-1167)  
 (AFOSR-66-2679; Rept.-5263-FR; AD-642406)

**CONTENTS:**

1. LASER OPERATING IN CIRCULARLY POLARIZED MODE p 1-5
2. USE OF CIRCULARLY POLARIZED LASER LIGHT TO INVESTIGATE PROPERTIES OF GYROTROPIC MEDIA p 6-11 refs

**APPENDIXES**

3. THE EFFECT OF REFLECTING SURFACES ON THE POLARIZATION STATE OF A LIGHT BEAM A. F. Quesada 14 p refs (See N67-17275 07-16)
4. ANALYSIS OF FOUR-MIRROR RESONANT CAVITY A. F. Quesada 11 p (See N67-17276 07-16)
5. CIRCULARLY POLARIZED LASER MODES IN RUBY J. Kaplan and J. Goldstein 7 p refs (See N67-17277 07-26)
6. APPLICATION OF THE SENARMONT POLARISCOPE TO ANALYSIS OF OPTICAL MASER LIGHT D. Hellerstein 5 p refs (See N67-17278 07-16)
7. ALIGNMENT OF Cr<sup>3+</sup> IN RUBY G. F. Hull, Jr., J. T. Smith, and A. F. Quesada 4 p refs (See N67-17279 07-26)

**N67-17277** Baird-Atomic, Inc., Cambridge, Mass.  
**CIRCULARLY POLARIZED LASER MODES IN RUBY**

J. Kaplan and J. Goldstein /In its Res. on Circularly Polarized Lasers and Their Use 31 Jul. (See N67-17274 07-16)

The optical properties of the ruby laser material Al<sub>2</sub>O<sub>3</sub>Cr<sup>3+</sup> are examined, and an energy level diagram for this material is presented. Such areas as the effects of the cubic field, the axial field, and spin-orbit interaction are indicated on the diagram. Zeeman splitting and the transition probabilities for different orientations and polarizations are also discussed. Finally, the effect of operating a ruby laser in a pure circularly polarized mode is considered. S.P.

**N67-17278** Baird-Atomic, Inc., Cambridge, Mass.  
**APPLICATION OF THE SENARMONT POLARISCOPE TO ANALYSIS OF OPTICAL MASER LIGHT**

David Hellerstein /In its Res. on Circularly Polarized Lasers and Their Use 31 Jul. 1966 5 p refs Repr. from Appl. Optics, v. 2, no. 8, Aug. 1963 p 801-805 (See N67-17274 07-16)

A Senarmont polariscope suitable for optical maser work has been constructed. It employs an optically active wedge and an analyzing polarizer to map the azimuthal angle onto a linear field, indicating this angle by null positions on a photographic plate. It measures the azimuth of linearly polarized light over a range of

180° with an accuracy at present of  $\pm 1.5^\circ$  and distinguishes between right and left circularly polarized light. This device is compact and relatively inexpensive; it requires no auxiliary electronic apparatus. Author

**N67-17358\*#** Aircraft Armaments, Inc., Cockeysville, Md.  
**FM MODULATION OF A CW LASER BEAM**

Washington, NASA, Feb. 1967 refs  
 (Contract NAS5-9660)

(NASA-CR-668) CFSTI: HC \$3.00/MF \$0.65 CSCL 20E

Frequency modulation and demodulation methods for CW lasers are analyzed in terms of amplitude noise sensitivity. Expressions are derived for detector noise limited signal to noise performance. Results of experiments performed with homodyne, optical discriminator and heterodyne detection breadboards are reported. An experimental transmitted reference heterodyne detection, angle modulated system is described. The modulator utilizes a 45 degree Y cut ADP crystal with length to thickness ratio of 8. Performance of the experimental breadboard over a 300 meter turbulent atmospheric path indicates that the angle modulated transmitted reference heterodyne system is insensitive to atmospherically induced noise fluctuations. Improvements in laser frequency stability are indicated to permit evaluation of broadband modulation capability. Author

**N67-17362** National Bureau of Standards, Boulder, Colo.  
**LASERS**

*In its Conf. on Precision Electromagnetic Meas.* 1966 p 6-17  
 (See N67-17361 07-14) CFSTI: HC \$3.00/MF \$0.65

Summaries are presented of conference papers which cover the state of the art and possible applications of lasers. Specific topics include: (1) aspects of fringe counting in laser interferometers, (2) interferometric measurements on diffuse surfaces by holographic techniques, (3) noise in lasers and laser detectors, (4) radiometric measurement of laser output, (5) calorimetric measurement of pulsed laser output energy, (6) a laser microcalorimeter, and (7) frequency stabilization of gas lasers. A.G.O.

**N67-17791\*#** Michigan Univ., Ann Arbor.

**RECENT ADVANCES IN HOLOGRAPHY**

E. N. Leith *In* NASA, Electron. Res. Center Aerospace Meas. Tech. 1967 p 173-189 refs (See N67-17781 07-14) GPO: HC \$1.00; CFSTI: MF \$0.65

The basic method for making a hologram is described, and based on lasers as the coherent light source are discussed. Details are given on techniques for holographic imagery through diffusing media; holographic recording in three-dimensional media; bias level reduction of incoherent holograms; contour generation; and color holograms. Figures are included to amplify the text. M.G.J.

**N67-17906#** Naval Ordnance Lab., White Oak, Md.  
**TIME RESOLVED STUDIES OF LASER-INDUCED PLUMES FROM SOLIDS Final Report**

Bernard V. Kessler and Charles E. Bell 9 Sep. 1966 31 p refs  
 (NOLTR-66-96; AD-643509) CFSTI: HC \$3.00/MF \$0.65

Time-resolved and time-integrated measurements were made of the plasma produced by a Q-switched laser beam focused on the surface of a metallic solid. Photographic, spectroscopic and charged particle emission data were taken on a nanosecond basis using a one megawatt peak power Nd laser. Experimental results indicate a plume velocity of 2.5cm/microsec., a plasma temperature of 40,000K and an electron density of  $5 \times 10$  to the 17th power/cc. It was also found that it requires 6-10 nanoseconds for a laser beam to penetrate a thin metal foil. Author (TAB)

**N67-17910#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**SESSIONS OF THE SECTION ON GENERAL AND APPLIED PHYSICS**

N. V. Karlov 27 Sep. 1966 7 p Transl. into ENGLISH from Vestn. Akad. Nauk SSR (Moscow), no. 8, 1965 p 82-84  
 (FTD-HT-66-458; TT-67-60232; AD-643875) CFSTI: HC \$3.00/MF \$0.65

The article describes a group of reports given on quantum electronics and the results and perspectives of the work conducted at the Oscillation Laboratory of the Physics Institute is analyzed. TAB

**N67-17946\*#** Perkin-Elmer Corp., Norwalk, Conn. Electro-Optical Group.

**GIANT APERTURE TELESCOPE STUDY**

J. Buckley 14 Dec. 1966 264 p refs

(Contract NAS7-100; JPL-951288)

(NASA-CR-81677; ER-8558) CFSTI: HC \$3.00/MF \$0.65 CSCL 17H

Phase II results are presented of a design study to determine the optimum configuration and engineering guidelines for the ground receiver of a deep space optical communications system. A 120-in fully steerable telescope for coherent detection at a wavelength near 10 microns was studied. The telescope's astronomical ability was examined and found to be well suited for its primary role as a coherent optical deep space communications receiver as well as a general purpose astronomical telescope. The discussion provides details on selecting a mount configuration, acquisition and tracking, the mechanical design of the telescope and mount, the optical system, the communications system tracking servo, system performance analyses, an error analysis, site location considerations, building and dome considerations, the telescope's astronomical utility, and an evaluation of a multiple aperture receiver. R.N.A.

**N67-17962\*#** Denver Research Inst., Colo.

**BUBBLE GROWTH PARAMETERS IN SATURATED AND SUBCOOLED NUCLEATE BOILING Final Report**

Thomas R. Rehm and C. W. Chiang 12 Jan. 1967 56 p refs  
 (Grant NGR-06-004-035)

(NASA-CR-81673; DRI-863-6701.f) CFSTI: HC \$3.00/MF \$0.65 CSCL 20M

An analysis of sample bubbles generated in the conventional type of boiling equipment with three different liquids: water, and water solution of 'sucrose' and 'propanol,' was conducted. The bubble histories for the 'sucrose' and 'propanol' solutions are compared to the bubble histories for water to demonstrate the effect of surface tension and viscosity on bubble behavior. Also conducted was an analysis of a single bubble individually generated by the use of a laser beam on a tiny thermocouple or a thin flat plate submerged in water. The feasibility of this laser beam method is shown, and it is noted that the sphericity of a single bubble is reasonably good. A.G.O.

**N67-17982\*#** Sylvania Electric Products, Inc., Waltham, Mass. Applied Research Lab.

**DEVELOPMENT OF AN OPTICAL SUPERHETERODYNE RECEIVER Interim Final Report No. 2, Mar. 1965-Oct. 1966**

R. Lucy Oct. 1966 81 p refs

(Contract NAS8-11588)

(NASA-CR-81659) CFSTI: HC \$3.00/MF \$0.65 CSCL 09F

An optical superheterodyne receiver, which operates at 6328 Å, is mounted in a mobile van, and can coherently detect signals from a remote laser transmitter, was designed, constructed and tested. Communications experiments, designed to evaluate the optical superheterodyne receiver and to compare coherent and noncoherent optical detector techniques, were performed over a one kilometer

path using a remote laser transmitter. The long and short term results obtained, plus results of frequency modulation experiments, provide information for comparing a noncoherent amplitude modulation system, a coherent amplitude modulated system, and a coherent frequency modulated system. The results show the superiority of noncoherent detection techniques when the system is not limited by background radiation noise. R.N.A.

**N67-18019\*** Stanford Univ., Calif. Microwave Lab.  
**INVESTIGATION OF LASER DYNAMICS, MODULATION AND CONTROL BY MEANS OF INTRA-CAVITY TIME VARYING PERTURBATION** Semiannual Status Report No. 2, 1 Aug. 1966-31 Jan. 1967  
 S. E. Haris Jan. 1967 9 p refs  
 (Grant NGR-05-020-103)  
 (NASA-CR-81730; ML-1502) CFSTI: HC \$3.00/MF \$0.65 CSDL 20E

Continuing work on the argon FM laser, parametric generation at optical frequencies, and backward wave oscillation in the far infrared are reported. A single frequency output power of 350 mW of single frequency light at 5145 Å was obtained with the argon laser with a distortion of less than 0.2%. The effect of power dependent homogeneous broadening on the distortion in the FM laser was emphasized, and it was determined that as the power is increased, the distortion of the oscillation is reduced. Experiments relating to the construction of an optical parametric oscillator wherein the nonlinear material is situated internally to the cavity of the pumping laser, and testing LiNbO<sub>3</sub> crystal for use as the nonlinear element are described. Progress in the backward wave oscillation program included debugging and stabilization of the high power Q-switched ruby laser, construction of a Dewar system for possible operation at liquid helium temperatures, and measurement of birefringence as a function of temperature in a LiTaO<sub>3</sub>. N.E.N.

**N67-18023\*** Perkin-Elmer Corp., Norwalk, Conn. Optical Group.  
**LASER/OPTICS TECHNIQUES** Second Interim Summary Report  
 Morley S. Lipsett 31 Dec. 1966 68 p ref  
 (Contact NAS8-20115)  
 (NASA-CR-81701; Rept.-8631) CFSTI: HC \$3.00/MF \$0.65 CSDL 20E

The development of transmit beam offset and coarse acquisition equipment for the Laser/Optics Techniques breadboard is described. In addition, preliminary acquisition and track simulation experiments carried out in the laboratory with the breadboard hardware are discussed. Author

**N67-18113\*** Joint Publications Research Service, Washington, D. C.  
**CONCERNING THE USE OF HIGHLY IONIZED PLASMA TO CREATE A LASER**  
 L. I. Gudzenko, V. N. Kolesnikov, N. N. Sobolev, and L. A. Shelepin 25 Jan. 1967 5 p refs Transl. into ENGLISH from Magnitnaya Gidrodinamika. (Riga), no. 3, Jul-Sep. 1965 p 54-56  
 (JPRS-39659; TT-67-30308)

Development of an optical quantum generator from a highly ionized low temperature plasma is discussed as a means of converting heat energy into both electrical and coherent light radiation energies. Two general methods are discussed for the abrupt cooling of the free electrons of the highly ionized, low temperature plasma. One method utilizes heavy particles of ions and neutral atoms of the plasma itself; the other uses the walls of the vessel as the cooling agent. Experiments are also being conducted on the use of magnetohydrodynamic cooling methods in which there is considerable separation of the electron temperature from that of the heavy particles; and such methods are considered applicable to the development of a new-type laser. M.W.R.

**N67-18123\*** George Washington Univ., Washington, D. C.  
**ORGANIC SYSTEMS INVOLVING TRANSITION METALS FOR LASER MATERIALS** Semiannual Report, Jul. 1-Dec. 31, 1966

N. Filipescu 31 Dec. 1966 5 p  
 (Grant NSG-603)  
 (NASA-CR-81780) CFSTI: \$3.00 CSDL 07C

Sensitive rare earth fluorescence in organic solvents, and the synthesis of model compounds and quantitative studies of intramolecular energy transfer are investigated in relation to development of organic laser materials. Migration of excitation energy from organic chromophores to rare earth ions results from an organic sensitizer, and lanthanide ion collision in solution occurs in which both the ion and sensitizer are nonassociated solutes. Characteristic three positive Eu, Tb, Dy, or Sm fluorescence is observed on excitation; fluorescence quantum efficiencies approaching unity were determined for the Tb and Eu acceptors. Results with no sensitizer other than the lanthanide ions should enable the establishment of efficient combinations for liquid laser materials; and larger diameter laser cells can be used than with chelates that must be surrounded by four ligand groups. The synthesized models have two different chromophores that are connected through a rigid inert molecular frame in which mutual orientation and distance of separation between chromophores is different. M.W.R.

**N67-18270\*** Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.  
**MEASUREMENT OF THE VELOCITY DISTRIBUTION FUNCTION OF A GAS USING A LASER**  
 Krishnamurthy Karamcheti, Sotiris P. Koutsoyannis, Munson A. Kwok, and Maurice L. Rasmussen May 1966 78 p refs  
 (Contract Nonr-225(81))  
 (SUDAAR-275; TR-1; AD-638795) CFSTI: HC \$3.00/MF \$0.65

The problems associated with the measurement of the velocity distribution function of a gas using a laser are presented and discussed. A simple theoretical model relating the frequency variation of the absorption coefficient across a spectral line of a gas to the distribution function of velocities in the direction of propagation of a plane monochromatic wave is developed and applied to measurements of attenuation of a laser beam passing through the gas. Experimental results with a d.c. excited neon gas and a He-Ne laser oscillating at 6328.2 Å show that under certain experimental conditions agreement with theory is good. Author (TAB)

**N67-18446\*** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.  
**LASER REFLECTIONS FROM THE BEACON EXPLORER SATELLITES**  
 Henry H. Plotkin [1965] 30 p refs Submitted for Publication  
 (NASA-TM-X-57166) CFSTI: HC \$3.00 CSDL 20E

Two satellites have been supplied by the Goddard Space Flight Center with arrays of cube-corner reflectors, and have been used as orbiting targets for ruby laser radiation. The observed intensity of reflected radiation is in agreement with theory. Although the distribution of the reflected light is affected by target geometry and atmospheric fluctuations, qualitative agreement was found with calculations of velocity aberration due to the satellite's motion. The system has been used to determine satellite range. R.L.I.

**N67-18668** France. Office National d'Etudes et de Recherches Aérospatiales, Chatillon-sous-Bagneux.  
**APPLICATIONS OF LASERS TO AEROSPACE STUDIES [APPLICATIONS DES LASER A DES ETUDES AEROSPATIALES]**  
 C. Veret In its Sci. Sessions of the O.N.E.R.A. [1966] p 13-14  
 (See N67-18661 08-34) CFSTI: \$3.00

The optical properties of lasers for aerospace technology are briefly evaluated in this conference paper. Time and space coherence of light emissions from various lasers were studied, and light impulses from ruby lasers were applied to telemetry procedures. Pulsed or continuous lasers were found to improve interferometer performance in wind tunnels due to their improved visualization capability of aerodynamic flow. Another application cited is the use of lasers in making trajectographies of a body in free fall for weightlessness studies. Transl. by R.L.I.

**N67-18747\*** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

#### MASER SPIN DYNAMICS

Harold A. Sabbagh Sep. 1966 24 p refs  
(NASA-TM-X-55676; X-523-66-448) CFSTI: HC \$3.00/MF \$0.65 CSCL 20E

Since masers are electronic devices that operate on quantum mechanical principles, new techniques must be employed for analysis of their performance. This paper attempts to present mathematical tools for the analysis of maser spin dynamics. A simple mathematical model of a maser spin system is employed to show how the frequency response characteristics (i.e., the absorption spectrum) of a maser spin system may be calculated. Then some significant parameters that determine those characteristics are pointed out. Although the analysis is general, some of the results are applied to a specific spin system: triply ionized iron-doped rutile. Author

**N67-18935\*** National Aeronautics and Space Administration, Washington, D. C.

#### DRAG EFFECT OF THE ACTIVE MEDIUM OF A GAS RING LASER [EFFET DE L'ENTRAÎNEMENT DU MILIEU ACTIF D'UN LASER A GAZ EN ANNEAU]

Dario Pecile and Edmond Batifol Jan. 1967 6 p Transl. into ENGLISH from French Presented at the Acad. Sci. Paris, 8 Aug. 1966

(NASA-TT-F-10693) CFSTI: HC \$3.00/MF \$0.65 CSCL 20E

A study was made of the beat frequency  $F$  between the oscillations corresponding to the two directions of travel in a ring laser cavity, when the gas discharge column constituting the active medium was in motion. The phenomenon, involving the dispersion of the active medium, should help to explain the operation of the laser. On the other hand, the experiment affords a method for shifting the zero of a laser gyroscope. This procedure does not require the introduction of solid elements into the cavity. Author

**N67-19095\*** Varian Associates, Beverly, Mass.  
**DEVELOPMENT AND CONSTRUCTION OF TWO HYDROGEN MASERS** Interim Technical Report, 1 Feb. 1962-31 May 1963

K. Vessof 30 Jan. 1964 61 p refs  
(Contract NAS8-2604)

(NASA-CR-82491) CFSTI: HC \$3.00/MF \$0.65 CSCL 20E

Optimal construction of two atomic hydrogen frequency standards was studied by combining lightweight, small size, and improved stability of the cavity and bulb structure in dielectrically loaded quartz spheres each, about 8 inches in diameter. The first parts designed included the mounting frame, vacuum manifold, and the general pump layout, as well as the hexapole magnet assembly and its mounting hardware. Size, weight, and power requirements of the low vacuum scavenger pumps of the differentially pumped maser system was reduced by using outgassed titanium hydride sorption techniques and a source collimator to reduce the flux of atoms in the off-axis direction. Measurements data on the relative stability of these two masers, as well as on their stability as measured via external communications were included. G.G.

**N67-19096\*** Honeywell, Inc., St. Paul, Minn. Research Dept.  
**EXPERIMENTAL RESEARCH ON CRITICAL PROBLEMS ASSOCIATED WITH THE LASER INTEGRATING GYRO** Final Report, 1 Jul. 1965-30 Jun. 1966

Frederick Aronowitz and Harry Gustafson 31 Jul. 1966 132 p  
(Contract NAS12-27)

(NASA-CR-82490; Rept.-12018) CFSTI: \$3.00 CSCL 20E

The effects of mode coupling due to scattering effects in a traveling wave He-Ne ring laser are investigated, both theoretically and experimentally. A Lamb-type calculation is made in which the effects of scattering are treated as source terms in Maxwell's equations. This results in a scattering correction to the self-consistent equations. The scattering correction to the single mode amplitude equations result in mode competition between the oppositely directed beams and possible extinction of one of the beams. The scattering correction to the frequency equations produces frequency synchronization between the oppositely directed beams. Experimental verification of both effects is given. Author

**N67-19130\*** Korad Corp., Santa Monica, Calif.

#### LASER GYRO BALANCER Final Report

H. P. Popick 24 Oct. 1966 12 p

(Contract NAS8-20585)

(NASA-CR-82449) CFSTI: HC \$3.00 CSCL 20E

A laser system has been designed and built to dynamically balance gyro rotors and statically balance accelerometers. The laser system is comprised of a power supply, laser head, focusing cone, water cooler, and remote control console. Criteria for selection of the laser system are given, and design principles including energy requirement, optical requirement, and electronics requirement analyses are discussed. Charts summarizing the weight changes of several different metals after laser irradiation are also included. A.G.O.

**N67-19224\*** Massachusetts Inst. of Tech., Cambridge.

#### INVESTIGATION OF THE USE OF MASERS IN THE INFRARED AND OPTICAL REGIONS

 Final Report, 1 Mar. 1964-31 Aug. 1966

Ali Javan and Charles H. Townes 30 Sep. 1966 21 p refs

(Contract AF 19(628)-4011)

(AFCL-66-727; AD-644826) CFSTI: HC \$3.00/MF \$0.65

Contents: gas laser research: interaction of an intense laser beam with matter. TAB

**N67-19235\*** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

#### DETERMINATION OF LOSSES IN A RUBY LASER WITH A DISADJUSTED RESONATOR

V. A. Filipovich, L. A. Bogdanovskaya, and V. I. Lebedev 28 Sep. 1966 9 p refs Transl. into ENGLISH from Zh. Prikl. Spektroskopii (USSR), v. 4, no. 3, 1966 p 236-239

(FTD-HT-66-492; TT-67-60333; AD-644169) CFSTI: HC \$3.00/MF \$0.65

A method is proposed for determining the losses in a ruby laser with a disadjusted resonator. It is shown that the probability method formula for generation energy correctly describes the dependence of generation energy upon the angle between the resonator mirrors if the experimental value of the losses is put into this formula. Author (TAB)

**N67-19271\*** Arkansas Univ., Little Rock. Dept. of Electronics and Instrumentation.

#### MEASUREMENT OF RAY DEVIATIONS IN AN OPTICALLY INHOMOGENEOUS FIELD

Robert L. Bond, George S. Ballard, and Joseph B. Story [1966] 7 p refs Submitted for Publication

(Grant NSG-713)

(NASA-CR-82463) CFSTI: HC \$3.00/MF \$0.65 CSCL 20F



Described is an experimental apparatus for recording the hologram of an optically inhomogeneous field by using a pulsed laser for image reconstruction. The image of the field is formed on a photographic plate which is also illuminated with a reference beam; both the angle and the direction of the ray deviation passing through the corresponding section of the field can thus be determined. Preliminary study results give an error of about 5%.

G.G.

# 1966

## IAA ENTRIES

**A66-25038****MODE SELECTION PROPERTIES OF SEGMENTED-ROD GIANT PULSE LASERS.**

Milton Birnbaum and Tom L. Stocker (Aerospace Corp., El Segundo, Calif.).

*Journal of Applied Physics*, vol. 37, Feb. 1966, p. 531-534. 18 refs. Contract No. AF 04(695)-469.

The segmented-rod ruby laser structure has been operated as a giant pulse laser by use of a Kerr cell to provide the required Q switching. The giant pulse output, peak power of  $10^6$  watts/cm<sup>2</sup> and pulsewidth of 30 nsec, has been analyzed by use of Fabry-Pérot etalons. The number of oscillating modes is shown to be similar to that previously observed in pulsed operation. Good agreement is found between the measured and computer-calculated frequency differences. The computer calculations presented indicate that the best performance can be expected when the two laser rod segments are of approximately equal length. (Author)

**A66-25043****INFLUENCE OF MODE NUMBER AND MODE DEGENERACY ON THE OUTPUT OF A RUBY LASER.**

Harold Wieder (International Business Machines Corp., Thomas J. Watson Research Center, Yorktown Heights, N.Y.).

*Journal of Applied Physics*, vol. 37, Feb. 1966, p. 615-621. 20 refs.

Investigation of a multimode resonator which is capable of supporting a large number of modes of approximately equal Q. The conjugate-concentric ruby resonator is a system in which a ruby lens images each of the external mirrors on the other. By merely perturbing the geometry of the resonator, it is possible to obtain three distinct types of output: quasicontinuous, regular spiking, and random spiking. From the results of various experiments which have been performed on the system, it was concluded that two parameters are sufficient to determine which of these outputs will be obtained from a multimode resonator. Regular spiking is favored over random spiking if the mode number exceeds some critical value; quasicontinuous behavior is favored over regular spiking if, in addition, the modes exhibit degeneracy. The experimental results are compared with some existing theories. M.F.

**A66-25049****EXPERIMENTAL AND THEORETICAL RUBY LASER AMPLIFIER DYNAMICS.**

Petrus V. Avizonis and Ronald L. Grotbeck (USAF, Systems Command, Research and Technology Div., Weapons Laboratory, Kirtland AFB, N.Mex.).

*Journal of Applied Physics*, vol. 37, Feb. 1966, p. 687-693. 22 refs.

ARPA-supported research.

Experimental measurements of the energy contributed by one or more ruby amplifier rods driven by a "Q-switched" (pulse length of  $10^{-7}$  sec) ruby oscillator are correlated to theoretical equations describing amplifier action. The equations describe amplification in all energy gain regimes, i.e., exponential, nonlinear, and saturated. The necessary requirements for the use of these equations are the prior knowledge of energy stored in the  $R_1$  level just before lasing, the energy input from an oscillator, and a "nonsaturable loss coefficient" (loss term) for the particular laser rod. Agreement between theory and experiment is demonstrated in all amplifier gain regimes. Energies of over 50 joules in single sub-microsecond pulses have been observed. No pulse narrowing has been noticed, but appreciable ruby damage occurs at these energy and power levels. (Author)

**A66-25057****GIANT LASER PULSE FORMATION USING ULTRASONIC Q-SPOILING.**

V. A. Suprynowicz (Connecticut, University, Storrs, Conn.).

*Journal of Applied Physics*, vol. 37, Feb. 1966, p. 778-784. 10 refs.

Experimental study of the formation of ultrasonically gated giant laser pulses. The results include photographs of the ruby under such conditions, the influence of ruby temperature, the effect of acoustical amplitude, and the influence of the gating medium. Some of the experimental results appear to indicate that cavitation plays a role in such gating processes, and the possibility that reflection from cavitation-induced shock waves is the responsible gating mechanism is discussed. F.R.L.

**A66-25062****TUNABILITY OF THE RAMAN LASER.**

H. E. Puthoff, R. H. Pantell, and B. G. Huth (Stanford University, Stanford, Calif.).

*Journal of Applied Physics*, vol. 37, Feb. 1966, p. 860-864. 12 refs. Contract No. Nonr-225(48).

Discussion of the stimulated Raman effect, with special emphasis on the possibility of constructing a tunable Raman laser in which tuning over tens of angstroms can be expected. The requirement which must be satisfied to obtain a broad tuning range is that the vibrational transition involved in the Raman scattering be simultaneously IR active - i.e., IR absorbing. The tuning characteristic of the  $704\text{-cm}^{-1}$  line in methylene chloride is examined in detail. F.R.L.

**A66-25065****PROPERTIES OF InAs LASERS.**

I. Melngailis and R. H. Rediker (Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.).

*Journal of Applied Physics*, vol. 37, Feb. 1966, p. 899-911. 23 refs.

Review of studies of the radiative transitions in InAs and of coherent emission from InAs diodes and optically excited bulk homogeneous samples. Two different recombination mechanisms can be distinguished in the IR radiation spectra of InAs. Present InAs diode lasers which emit near  $3.1\mu$  (band-to-acceptor line) have external quantum efficiencies of about 12% and threshold current densities of about  $300\text{ amp/cm}^2$  at  $11^\circ\text{K}$ , and they can be operated continuously with currents of several amp. With magnetic fields of several kgauss applied perpendicularly to the diode current the threshold has been further reduced and the efficiency increased to as much as 25%. This enhancement of emission is shown to be associated with a decrease of injected carrier diffusion in the magnetic field which produces a more compact active region. It is considered that further improvements may be possible in the threshold and efficiency of InAs lasers, since the theoretical limits have not been reached as yet. F.R.L.

**A66-25102 #****INTERACTION BETWEEN TRAVELING WAVES IN A RING LASER [VZAIMODEISTVIE BEGUSHCHIKH VOLN V KOL'TSEVOM LAZERE].**

E. M. Belenov, E. P. Markin, V. N. Morozov, and A. N. Oraevskii (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*ZHETF Pis'ma v Redaktsiiu*, vol. 3, Jan. 1, 1966, p. 54-58. 5 refs. In Russian.

Experimental investigation of the beats of traveling waves created in a ring laser mounted on a rotating platform. In such a laser, division of the traveling wave frequencies  $\Delta$  takes place only for rotating rates  $v$  in excess of a certain critical value  $v_{cr}$  (or the corresponding  $\Delta_{cr} = 2kV_{cr}/\pi$ , where  $v$  is the linear velocity of the resonator mirrors, and  $k$  is the wave vector). An analysis of the quantity  $\Delta_{cr}$  as a function of the laser parameters shows that by properly selecting these parameters it is possible to substantially reduce the capture band. V.P.

**A66-25103 #**

FREQUENCY SHIFT OF THE OPTICAL TRANSITION IN A LIGHT WAVE FIELD [SMESHCHENIE CHASTOTY OPTICHESKOGO PEREKHODA V POLE SVETOVOI VOLNY].

E. B. Aleksandrov, A. M. Bonch-Bruевич, N. N. Kostin, and V. A. Khodovoi (Gosudarstvennyi Opticheskii Institut, Leningrad, USSR).

*ZHETF Pis'ma v Redaktsiiu*, vol. 3, Jan. 15, 1966, p. 85-88. In Russian.

Observation of a frequency shift of the order of  $10^9$  cps in the resonance transition  $4S_{1/2} \rightarrow 4P_{1/2, 3/2}$  (principal doublet) induced in potassium vapor by a powerful ruby laser pulse. The experimental setup and procedure are described in detail and it is shown that virtual transitions from the  $4S_{1/2}$  to  $4P_{1/2, 3/2}$  and from the  $4P_{3/2}$  to  $6S_{1/2}$  levels make the greatest contributions to this frequency shift.

V. Z.

**A66-25112**

GALLIUM ARSENIDE LASER DIODES.

Rolf Gremmelmaier and Hans-Joachim Henkel.

*Siemens Review*, vol. 33, Mar. 1966, p. 107-110, 17 refs.

Sketch of work done on GaAs lasers. The operation and characteristics of semiconductor lasers are outlined. Work done with GaAs laser diodes by Siemens is briefly summarized. R. A. F.

**A66-25144**

THE HOLOGRAM AND THE RECONSTRUCTION OF WAVEFRONTS [DAS HOLOGRAMM UND DIE REKONSTRUKTION DER WELLENFRONTEN].

D. Wölpert.

*Bildmessung und Luftbildwesen*, vol. 34, Mar. 1, 1966, p. 31-37, 7 refs. In German.

Discussion of various types of holograms and the optical techniques required for image reconstruction. Transparency-type holograms are described in which part of the coherent and monochromatic light from a laser is allowed to pass through a prism which refracts it in such a manner as to cause it to fall on a photographic emulsion, while the other part passes through a transparent objective and also impinges on the emulsion; the interference pattern is caused by the superposition of the light wavefronts refracted through the prism and the wavefronts scattered by passage through the transparent objective. To reconstruct the image of the object laser light is caused to pass through the transparent emulsion on which the interference pattern was recorded. A second type of hologram is described in which an interference pattern of a solid object is recorded by an emulsion. The main difference between this method and the hologram of a transparency is the use of a reflecting mirror instead of the prism. Applications for these techniques are discussed.

D. P. F.

**A66-25187 #**

A METHOD FOR EVALUATING THE CAVITY LOSS AND AN OPTIMUM REFLECTIVITY OF THE OUTPUT MIRROR IN A RUBY LASER WITH AN EXTERNAL MIRROR.

Yoshihiro Ohtsuka (Osaka University, Dept. of Applied Physics, Osaka, Japan).

*Japanese Journal of Applied Physics*, vol. 5, Jan. 1966, p. 74-78, 9 refs.

Both the cavity loss and an optimum reflectivity of the output mirror were determined experimentally from a set of measurements of the laser energy output for different glass plates placed as attenuators inside the cavity. The internal cavity loss value and the optimum value of the reflectivity for the ruby used were  $0.14 \pm 0.01$  per pass and 0.73, respectively under the pumping of 1000 joules, with mirror spacing of 23.6 cm, and at fixed temperature of  $13^\circ\text{C}$ . This optimum reflectivity was in good agreement with the one obtained by the measurements of the energy output for different reflectivities of the output mirror.

(Author)

**A66-25188 #**

MEASUREMENT OF GROUND-STATE POPULATION IN RUBY UNDER OPTICAL PUMPING.

Toshizo Nakaya (Konan University, Dept. of Physics, Kobe, Japan). *Japanese Journal of Applied Physics*, vol. 5, Jan. 1966, p. 79-85, 7 refs.

Depopulation of ground-state Cr ions in ruby (DGS) under optical pumping with a Xe flash light has been measured as a function of time. Experiments have been made by means of measuring the decrease in absorbing power for a probe light ( $5790\text{\AA}$  or  $5461\text{\AA}$ ) from a Hg lamp. DGS reaches its maximum value after some delay from the peak of Xe light, and decreases after discontinuation of optical pumping with a time constant of 3.4 ms, which is the lifetime of metastable-state  $^2E$ . During laser oscillation mean value of DGS is forced to take a constant value, which varies with the condition of laser oscillation. So long as the input energy to the Xe lamp is not altered, the shorter the duration of Xe flash light is, the higher becomes the maximum value of DGS. On the basis of the rate equation, these experimental results have been explained.

(Author)

**A66-25189 #**

ANGULAR DISTRIBUTION OF STIMULATED RAMAN RADIATION.

Koichi Shimoda (Tokyo, University, Dept. of Physics, Tokyo, Japan). *Japanese Journal of Applied Physics*, vol. 5, Jan. 1966, p. 86-92, 18 refs.

The angular distribution of Stokes and anti-Stokes radiations generated by a laser beam in a filamentary region is calculated. Three cases are discussed: one is the surface radiation which is found to appear if the filament is very thin and long. Secondly, if the first-order Stokes is broadly generated off-axis and the filament is thick, the theory gives volume phase-matching which has been observed as class I radiation. Finally, if the first-order Stokes is strongly directed along the axis and the filament is thin, Raman radiations at angles between those of surface and volume phase-matching conditions are found. They represent class II radiations which have been normally observed in many liquids. Theoretical cone-angles of higher-order Stokes and anti-Stokes show very good agreement with experimental observations by Garmire. Some properties of class I and class II radiations are also explained by this theory.

(Author)

**A66-25195 #**

ON THE DIFFRACTION LOSS OF OPTICAL RESONATOR.

Ryuichi Hioki and Takeomi Suzuki (Tokyo, University, Dept. of Applied Physics, Tokyo, Japan).

(Japan Society of Applied Physics, Fall Meeting, Tokyo, Japan, Nov. 1964, Paper.)

*Japanese Journal of Applied Physics*, vol. 5, Feb. 1966, p. 160-166, 7 refs.

The oscillation characteristics are reported of a helium-neon laser equipped with a resonator which consists of two concave spherical reflectors with non-identical curvatures. Laser oscillations in resonator arrangements of the so-called high loss geometry are studied. The powers and the field patterns of the output beam are shown. An intuitive interpretation of the high loss in a confocal resonator is also given, and is compared with Fox and Li's treatment.

(Author)

**A66-25251 #**

THE POTENTIAL ROLE OF OPTICAL COMMUNICATIONS IN THE EXPLORATION OF MARS.

Herbert B. Hallock, Joseph Grusauskas, and Donald R. Lamberty (Grumman Aircraft Engineering Corp., Bethpage, N. Y.).

IN: AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS, AND AMERICAN ASTRONAUTICAL SOCIETY, STEPPING STONES TO MARS MEETING, BALTIMORE, MD., MARCH 28-30, 1966. TECHNICAL PAPERS. [A66-25234 13-30]

New York, American Institute of Aeronautics and Astronautics, 1966, p. 168-187, 38 refs.

Research supported by the Grumman Aircraft Engineering Corp.

General analysis of the technical and operational tradeoffs involved in selecting for a carrier an optical, rather than a much lower frequency, based on an examination of probable mission requirements. The probable cost effectiveness is discussed. Since fine stabilization and laser pointing to extreme accuracy are necessary for utilization of optical communications over the range between

Mars and the earth, emphasis is placed on costs in system complexity. System approaches which embody means of surmounting technical obstacles are outlined. The selection of laser, modulator, antenna and antenna coupler is treated, as well as the development of precision tracking and fine laser pointing techniques. It is concluded that the effort to apply this new technology will be difficult, but highly rewarding. M.M.

#### A66-25322 #

LASER WITH AN ORDERED PULSE SEQUENCE [OPTICHESKII KVANTOVYI GENERATOR S UPORIADOCHENNOI POSLEDOVA-TEL'NOST' I U IMPUL' SOV].

Iu. I. Kruzhilin.

*Pribery i Tekhnika Eksperimenta*, vol. 11, Jan. -Feb. 1966, p. 154-156. In Russian.

Description of a laser that produces two or three light pulses in sequence, with a mechanically controlled interval between pulses. An optical wedge is inserted into the resonator to control the duration of the interval. For an interval of 0.8  $\mu$ sec scattering is less than  $\pm 5\%$ . A laser optical system is discussed that makes it possible to study the overpopulation effect in a laser crystal. V. Z.

#### A66-25323 #

ADJUSTMENT OF A MULTIMIRROR LASER [NASTROIKA MNOGO-ZERKAL'NOGO OPTICHESKOGO REZONATORA].

A. Z. Grasiuk and I. G. Zubarev (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*Pribery i Tekhnika Eksperimenta*, vol. 11, Jan. -Feb. 1966, p. 156-158. In Russian.

Description of an adjustment procedure for a laser with a polygonal resonator. The necessity of a spatial mirror adjustment in addition to an angular adjustment is noted. Technical aspects of this procedure are discussed and practical directions are given. V. Z.

#### A66-25404

OBSERVATION OF VELOCITY AND PRESSURE CORRELATIONS IN A TURBULENT FLOW [L'OBSERVATION DES CORRELATIONS DE VITESSE ET DE PRESSION DANS UN ECOULEMENT TURBULENT].

Pierre Gilles de Gennes (Paris, Université, Centre d'Orsay, Orsay, Seine-et-Oise, France).

*Académie des Sciences (Paris), Comptes Rendus, Série A - Sciences Mathématiques*, vol. 262, no. 1, Jan. 3, 1966, p. 74-77. In French.

Calculation of the effective diffusion cross section for an ultrasonic beam and for an optical laser beam on a distinctly subsonic turbulent flow. The effective cross section for ultrasound is found to be proportional to the space-time velocity correlation function. It is shown that the effective optical cross section involves pressure correlations. A. B. K.

#### A66-25410

HIGH-POWER CONTINUOUS STIMULATED EMISSION OBTAINED IN PURE CARBON DIOXIDE [EMISSION STIMULEE CONTINUE, DE GRANDE PUISSANCE, OBTENUE DANS LE GAZ CARBONIQUE PUR].

Charles Frapard, Pierre Laures, and Maurice Roulot (Compagnie Générale d'Electricité de Paris, Centre de Recherches, Département Recherches Physiques de Base, Marcoussis, Seine-et-Oise, France).

*Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques*, vol. 262, no. 1, Jan. 3, 1966, p. 45-48. 8 refs. In French.

Observation of infrared laser radiation with a power of 5.7 watts in the vicinity of 10.69  $\mu$  in a sealed tube containing pure  $\text{CO}_2$  excited by ac or dc current. On the basis of a spectrographic analysis 19 lines are recorded, of which five are new. They are identified as the lines  $P_8$  to  $P_{44}$  of the  $\nu_3 - 2\nu_2$  vibrational transition. A. B. K.

#### A66-25425

MECHANISM OF BREAKDOWN IN GASES BY LASER [SUR LE MECANISME DU CLAQUAGE DES GAZ PAR LASER].

Vincent Chalmeton and Renaud Papoulet (Commissariat à l'Energie Atomique, Centre d'Etudes Nucléaires de Saclay, Service de Documentation, Gif-sur-Yvette, Seine-et-Oise, France).

*Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques*, vol. 262, no. 3, Jan. 17, 1966, p. 177-180. In French.

Analysis of the phenomena connected with the nonlinear dielectric absorption of laser light by a neutral gas, where this absorption results in avalanche breakdown of the gas. The absorption of the laser light heats the gas to a high temperature. Thermal ionization is then sufficient to stimulate further heating by bremsstrahlung, and this results in the avalanche breakdown of the gas. It is shown that the original free electrons in the gas were emitted as a consequence of thermal ionization. The analysis of the light given off by the gas above the threshold value makes it possible to determine the dielectric absorption coefficient. When the time-variation of the laser pulse is considered, the conditions for avalanche breakdown may then be ascertained. D. P. F.

#### A66-25437

GENERATION OF THE SECOND HARMONIC OF LASER RADIATION AT 10.6  $\mu$  IN A TELLURIUM MONOCRYSTAL [GENERATION DU DEUXIEME HARMONIQUE D'UN RAYONNEMENT LASER A 10.6  $\mu$  DANS UN MONOCRISTAL DE TELLURE].

Nguyen Van Tran, Jean Hanus, and Denis Kehl (Compagnie Générale d'Electricité de Paris, Centre de Recherches, Département de Recherches Physiques de Base, Marcoussis, Seine-et-Oise, France).

*Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques*, vol. 262, no. 4, Jan. 24, 1966, p. 272-274. 9 refs. In French.

Observation of the generation of the second harmonic with a wavelength of 5.30  $\mu$  from laser radiation at a wavelength of 10.6  $\mu$  by transmission through a tellurium monocrystal. The  $\text{CO}_2$ -N<sub>2</sub> gas laser had a plane-confocal structure and an output of 100 mw. The phase velocities of the fundamental and the harmonic frequency must be equal within the crystal for optimum efficiency in generating the second harmonic. An interference filter is used in filtering out all radiation at the fundamental frequency. The detector for recording the intensity of the secondary harmonic is composed of InSb and is cooled to 77°K. The observed difference between the predicted and the measured values is of the order of 30%. D. P. F.

#### A66-25438

LASER EFFECT IN INDIUM ARSENIDE AND GALLIUM ANTIMONIDE BY OPTICAL EXCITATION [EFFET LASER DANS L'ARSENURE D'INDIUM ET L'ANTIMONIURE DE GALLIUM PAR EXCITATION OPTIQUE].

Claude Benoit à la Guillaume and Jean-Marie Laurant (Paris, Université, Ecole Normale Supérieure, Laboratoire de Physique, Paris, France).

*Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques*, vol. 262, no. 4, Jan. 24, 1966, p. 275-277. 8 refs. In French.

Description of experiments with InAs and GaSb samples at 20 and 4°K in which the laser radiation produced by optical excitation is investigated. The samples were obtained by cleaving thin polished plates of the two compounds. The exciting beam of light is focused on a polished surface of the sample and the laser emission is observed with a Perkin-Elmer LiF-prism filter in the case of InAs and a 150-lines/mm grid for GaSb. The signal is amplified and recorded. The InAs sample was excited by a GaAs diode with a current of more than 30 amp in pulses of 0.6  $\mu$ sec duration and a period of 1000 kc. In the case of GaSb the exciting diode current was more than 45 amp. N-type InAs with  $4.5 \times 10^{16}$  carriers/cm<sup>3</sup> was used; the concentration of carriers in the n-type GaSb samples was  $2.10 \times 2 \times 10^{17}$  cm<sup>-3</sup>. D. P. F.

#### A66-25479

ENERGY SPECTRA OF IONS EMITTED BY BERYLLIUM, CARBON, AND MOLYBDENUM UNDER THE ACTION OF A LASER BEAM [SPECTRES DE L'ENERGIE DES IONS EMIS PAR LE BERYLLIUM, LE CARBONE ET LE MOLYBDENE SOUS L'ACTION DU FAISCEAU D'UN LASER].

## A66-25518

Gianfranco Tonon (Commissariat à l'Energie Atomique, Centre d'Etudes de Limeil, Villeneuve-Saint-Georges, Seine-et-Oise, France).

Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques, vol. 262, no. 10, Mar. 7, 1966, p. 706-709, 8 refs. In French.

Tracing of the energy spectra of various types of ions obtained by directing a focused laser beam at targets of beryllium, carbon, and molybdenum. The influence of the laser intensity is studied for the case of carbon. F.R.L.

## A66-25518

MATERIALS FOR SOLID STATE OPTICAL DEVICES.

J. E. Geusic (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

IN: NEREM RECORD 1965; NORTHEAST ELECTRONICS RESEARCH AND ENGINEERING MEETING, BOSTON, MASS., NOVEMBER 3-5, 1965, PAPERS. VOLUME 7. [A66-25501 13-09]

Meeting sponsored by the New England Sections of the Institute of Electrical and Electronics Engineers. Boston, Institute of Electrical and Electronics Engineers, Boston Section, 1965, p. 78. 9 refs. Abridged.

Account of developments in the field of research into new materials for solid-state optical devices. With the recent development of the Neodymium-doped Yttrium Aluminum Garnet (Nd:YAG) laser, the continuous solid-state laser has for the first time been able to compete with the gas laser. In some respects it has already surpassed the CW performance of gas lasers. Recently experimenters have achieved 42 watts of CW power from a Nd:YAG laser using a vortex stabilized argon-arc pump lamp. This is the largest CW optical power that has been achieved with any laser. Another most important material advance was the discovery that Lithium Meta Niobate (LiNbO<sub>3</sub>) has an optical nonlinear coefficient about 11 times larger than KDP and that phase matching could be achieved without double refraction. One material, Potassium Tantalate Niobate (KTN), has been shown to have a large electrooptic effect. M.F.

## A66-25531

FOCUSING OF LASER LIGHT BY TARGET SURFACES AND EFFECTS ON INITIAL TEMPERATURE CONDITIONS.

W. P. Hansen, S. Fine, G. R. Peacock (Northeastern University, Boston, Mass.), and E. Klein (Roswell Park Memorial Institute, Buffalo, N.Y.).

IN: NEREM RECORD 1965; NORTHEAST ELECTRONICS RESEARCH AND ENGINEERING MEETING, BOSTON, MASS., NOVEMBER 3-5, 1965, PAPERS. VOLUME 7. [A66-25501 13-09]

Meeting sponsored by the New England Sections of the Institute of Electrical and Electronics Engineers. Boston, Institute of Electrical and Electronics Engineers, Boston Section, 1965, p. 156, 157. Abridged.

U. S. Public Health Service Contract No. 1 R01-RH-00361-01 RAD; Contracts No. DA-49-193-MD-2436; No. DA-49-193-MD-2437.

Outline of the use of optical ray tracing methods to predict focusing characteristics of laser light in refractive targets. The techniques are given for calculating heating effects in a target with known focusing and absorption parameters. Parameters affecting laser focus within biological material such as target geometry, refractive index, thickness of skin layers, degree of collimation of the incident beam, and time-varying skin distention during laser impact are discussed. The converging cone of light, used to produce high-power densities within biological materials, is considered in conjunction with flat and spherical target geometries, and the initial temperature distribution for converging radiation incident on a flat target surface is analyzed. B.B.

## A66-25541

COHERENT LIGHT RECORDING TECHNIQUES.

C. H. Becker (Precision Instrument Co., Palo Alto, Calif.).

IN: NEREM RECORD 1965; NORTHEAST ELECTRONICS RESEARCH AND ENGINEERING MEETING, BOSTON, MASS., NOVEMBER 3-5, 1965, PAPERS. VOLUME 7. [A66-25501 13-09]

Meeting sponsored by the New England Sections of the Institute of Electrical and Electronics Engineers. Boston, Institute of Electrical and Electronics Engineers, Boston Section, 1965, p. 196, 197. Abridged. Contract No. AF 30(603)-3272.

Review of the principles and techniques of coherent light recording and reproducing. The dynamic range of coherent light recording and reproducing is determined by the noise sources of the system. These include laser, modulator, recording film, reproducing photomultiplier, etc. However, the predominant factor which determines the dynamic range is the optical density variation in the recording medium. M.M.

## A66-25555

CHARACTERISTICS OF METAL WALL IONIZED ARGON LASERS. R. A. Paananen, A. Adams, Jr., and D. T. Wilson (Raytheon Co., Research Div., Waltham, Mass.).

IN: NEREM RECORD 1965; NORTHEAST ELECTRONICS RESEARCH AND ENGINEERING MEETING, BOSTON, MASS., NOVEMBER 3-5, 1965, PAPERS. VOLUME 7. [A66-25501 13-09]

Meeting sponsored by the New England Sections of the Institute of Electrical and Electronics Engineers.

Boston, Institute of Electrical and Electronics Engineers, Boston Section, 1965, p. 238, 239. Abridged.

Contracts No. AF 33(615)-3063; No. DA-01-021-AMC-12427(Z).

Description of work for the development of satisfactory metal, or coated metal, discharge structures for ionized argon lasers in embodiments similar to that found useful with quartz. The two methods used are: (1) the technique of segmentation or fractionation of the desired length into separate pieces; and (2) the use of single piece anodized aluminum channels, whereby the thin layer of Al<sub>2</sub>O<sub>3</sub> provides the desired insulation. No essential difference in the general operating behavior between quartz and metal ionized argon lasers has been noted. At times, the discharge may be more difficult to initiate in the metal structures, but the use of the usual longitudinal magnetic field helps to overcome the problem. M.M.

## A66-25556

SEMICONDUCTOR BULK INJECTION LASERS.

I. Melngailis (Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.).

IN: NEREM RECORD 1965; NORTHEAST ELECTRONICS RESEARCH AND ENGINEERING MEETING, BOSTON, MASS., NOVEMBER 3-5, 1965, PAPERS. VOLUME 7. [A66-25501 13-09]

Meeting sponsored by the New England Sections of the Institute of Electrical and Electronics Engineers.

Boston, Institute of Electrical and Electronics Engineers, Boston Section, 1965, p. 240, 241. Abridged.

Results of experiments on semiconductor lasers in which the active region extends a substantial distance into the bulk areas from the injecting contacts, as compared with junction lasers in which the active region is in the form of a very thin sheet or very near to the junction transition region. The transient behavior of semiconductor bulk lasers indicates that in some ways they resemble solid-state ionic lasers, rather than semiconductor junction lasers of the GaAs type. For example, effects of energy storage have been observed. In some of the bulk lasers a type of coherent emission was observed which follows the end of the applied current pulse with a delay of 1 nsec or less. This type of emission is attributed to an increase in the probability for radiative transitions which results from the cooling down of hot carriers following the removal of the applied electric field. M.M.

## A66-25557

ELECTRON-BEAM-CONTROLLED SCANLASER.

R. V. Pole and R. A. Myers (International Business Machines Corp., Yorktown Heights, N.Y.).

IN: NEREM RECORD 1965; NORTHEAST ELECTRONICS RESEARCH AND ENGINEERING MEETING, BOSTON, MASS., NOVEMBER 3-5, 1965, PAPERS. VOLUME 7. [A66-25501 13-09]

Meeting sponsored by the New England Sections of the Institute of Electrical and Electronics Engineers.

Boston, Institute of Electrical and Electronics Engineers, Boston Section, 1965, p. 244, 245. Abridged.

Description of a device which combines the advantages of the cathode ray tube and the laser, in which the electron beam controls the direction of emission of a laser. To accomplish this, an angularly degenerate and optically conjugated laser resonator is combined with a CRT via an electrooptic transducer. The arrangement is schematically depicted. It is noted that, as a consequence

of the fact that the electron beam merely controls the location of the output spot, the brightness of the electron-beam-controlled scan laser will be limited primarily by the gain of the active medium; and thus the device described should perform like a CRT whose face plate, an inefficient energy converter, has been replaced by an energy amplifier. M.M.

#### A66-25650

##### PHASE AND AMPLITUDE FLUCTUATIONS OF THE LASER OSCILLATOR.

H. J. Pauwels (Massachusetts Institute of Technology, Dept. of Electrical Engineering and Research Laboratory of Electronics, Cambridge, Mass.).

IEEE Journal of Quantum Electronics, vol. QE-2, Mar. 1966, p. 54-62. 10 refs.

Contract No. DA-36-039-AMC-03200(E).

A quantum theory for noise in the steady state of the laser oscillator above threshold is presented. The concept of operator noise source is introduced. A simple laser model operating in a single mode with resonant frequency tuned to the center of the material line is considered. The resonance linewidth of the inverted material is collision-broadened, and assumed to be much broader than the cold-cavity width. We restrict ourselves to one type of collision. The quantum description of the laser model leads to nonlinear operator equations. These are linearized, but this linearization is justified only for operation "sufficiently" above threshold. The first- and second-order Glauber functions and the expectation value of the field commutator are derived for the field inside the laser cavity. These results are compared with the predictions of a "semiclassical" theory in which the classical equations contain noise sources such that properties of the field below threshold are correctly predicted. Our results differ by certain terms from the results of this semiclassical theory. These terms are too small to have been detected experimentally. (Author)

#### A66-25651

##### THE OUTPUT POWER OF A 6328-Å He-Ne GAS LASER.

P. W. Smith (Bell Telephone Laboratories, Inc., Crawford Hill Laboratory, Holmdel, N.J.).

IEEE Journal of Quantum Electronics, vol. QE-2, Mar. 1966, p. 62-68. 10 refs.

Expressions are derived for the output power of a gas laser in single-mode operation. This theory is then extended to multimode operation where the mode spacing is less than the pressure-broadened "natural" atomic linewidth. Using measured values for the linewidth and saturation parameters, these formulas are used to predict 6328-Å output power for a He-Ne laser as a function of laser gain, cavity loss, and output coupling. Experiments are reported which show good agreement with the theoretical predictions, and it is concluded that the theory presented here is adequate to describe the main features of the power output behavior of a 6328-Å He-Ne gas laser. (Author)

#### A66-25654

##### A PRECISE OPTICAL INSTRUMENTATION RADAR.

T. C. Hutchison, A. A. Hagen, H. Laudon, and C. R. Miller (Sperry Rand Corp., Sperry Gyroscope Co., Great Neck, N.Y.).

IEEE Transactions on Aerospace and Electronic Systems, vol. AES-2, Mar. 1966, p. 158-168.

An instrumentation tracker is described which provides real-time positional data on high-speed cooperative targets with precisions of  $\pm 1$  m at ranges between 300 m and 10 km. Unambiguous range is determined by a precise digital FM-CW ranging technique at a rate of 15 per sec. A target-mounted beacon and a narrow laser ranging beam permit measurement of target position to values much less than target dimension. Azimuth and elevation angles are read out by precision shaft angle encoders and recorded in binary form, along with range and time, on magnetic tape or directly into a real-time computer. (Author)

#### A66-25684 #

LASER WITH MAXIMUM MODULATION DEPTH OF THE RESONATOR Q FACTOR [LAZER Z MAKSYMAL'NOIU GLIBINOIU MODULIU VAN- NIA DOBROTNOSTI REZONATORA].

M. G. Starunov, V. D. Er'omka, and V. I. Bonchkovskii (Akademiia Nauk Ukrain's'koi RSR, Institut Radiofiziki i Elektroniki, Kharkov, Ukrainian SSR).

Ukrains'kii Fizichnii Zhurnal, vol. 11, Feb. 1966, p. 217, 218. 7 refs. In Ukrainian.

Discussion of an experiment performed with a two-ruby laser (each ruby measuring 24 cm in length and 1.25 cm in diameter), in which both mirrors were separated from the crystals. The conditions under which giant pulses were obtained are described. V.P.

#### A66-25824

##### TECHNIQUE FOR ALIGNING LASER MIRRORS USING GAS LASER.

P. N. Everett (Mitre Corp., Bedford, Mass.).

Review of Scientific Instruments, vol. 37, Mar. 1966, p. 375. Contract No. AF 19(628)-2390.

Description of a method for squaring laser mirrors which is considered suitable for a number of common laser cavities. The basic method allows the mirrors to be rendered parallel within about 0.5 mrad depending on the geometry; a refinement of the method can provide greater accuracy if required. The method's geometry is illustrated; it is based on the alignment or superimposing of multiple spots of light produced by multiple reflections of a CW gas laser beam from the mirrors of the system. When the spots are superimposed, the mirrors are accurately aligned. M.L.

#### A66-25833

##### ESTIMATE THE SOLAR NOISE OF OPTICAL COMMUNICATION SYSTEMS.

Norman Koch (Bissett-Berman Corp., Santa Monica, Calif.).

Electronic Design, vol. 14, Mar. 29, 1966, p. 56, 57.

Graphical estimation of the solar noise of optical communication systems, showing that noise depends on wavelength and look angle. Two graphs are presented. The first one shows that the reflected solar background radiation picked up by a detector depends on its aperture. This noise power also increases with larger look angle. The curves on this graph are useful for GaAs diodes and for injection lasers. The second series of curves illustrate incident solar power vs the aperture of the receiver for systems operating in the range of 4500 and 7000 Å. These curves are recommended for most He-Ne lasers and the 6943-Å ruby laser. F.R.L.

#### A66-25934

##### GaAs p-n JUNCTION LASER WITH NONUNIFORM DISTRIBUTION OF INJECTION CURRENT.

N. G. Basov, Iu. P. Zakharov, V. V. Nikitin, and A. A. Sheronov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(Fizika Tverdogo Tela, vol. 7, Oct. 1965, p. 3128-3130.)

Soviet Physics - Solid State, vol. 7, Apr. 1966, p. 2532, 2533.

Translation.

[For abstract see issue 05, page 692, Accession no. A66-14659]

#### A66-25967

##### SPATIAL DISTRIBUTION OF THE ELECTRIC FIELD PRODUCED BY FOCUSING THE OUTPUT OF A RUBY LASER.

T. M. Barkhudarova, G. S. Voronov, V. M. Gorbunkov, and N. B. Delone (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 49, Aug. 1965, p. 386-388.)

Soviet Physics - JETP, vol. 22, Feb. 1966, p. 269-271. 9 refs. Translation.

[For abstract see issue 01, page 80, Accession no. A66-10250]

#### A66-25982

DIGITAL LASER RANGING AND TRACKING USING A COMPOUND AXIS SERVOMECHANISM.

## A66-25984

Thomas W. Barnard and Carroll R. Fencil (Perkin-Elmer Corp., Norwalk, Conn.).

Applied Optics, vol. 5, Apr. 1966, p. 497-505.

Description of a system for optical tracking which uses plane-polarized coherent laser beams and a compound-axis servosystem for providing a control of optical energy not previously available. This system gives precise tracking and slant-range information at a real-time sampling rate of 200 cps. The system utilizes a mirror assembly mounted on a tracking pedestal and provides angular data by tracking a laser-illuminated retroreflector mounted on the target. The slant range to the retroreflector is determined by a digital-mode FM CW-laser ranging system; the resolution and sampling rate of this system are under independent control. D. P. F.

## A66-25984

### PRECISION LASER AUTOMATIC TRACKING SYSTEM.

R. F. Lucy, C. J. Peters, E. J. McGann, and K. T. Lang (Sylvania Electric Products, Inc., Sylvania Electronic Systems Div., Applied Research Laboratory, Waltham, Mass.).

Applied Optics, vol. 5, Apr. 1966, p. 517-524. 14 refs.

NASA-sponsored research.

A precision laser tracker has been constructed and tested that is capable of tracking a low-acceleration target to an accuracy of about 25  $\mu$ rad root mean square. In tracking high-acceleration targets, the error is directly proportional to the angular acceleration. For an angular acceleration of 0.6 rad/sec<sup>2</sup>, the measured tracking error was about 0.1 mrad. The basic components in this tracker, similar in configuration to a heliostat, are a laser and an image dissector, which are mounted on a stationary frame, and a servo-controlled tracking mirror. The daytime sensitivity of this system is approximately  $3 \times 10^{-10}$  watts/m<sup>2</sup>; the ultimate nighttime sensitivity is approximately  $3 \times 10^{-14}$  watts/m<sup>2</sup>. Experimental tests were performed to evaluate both dynamic characteristics of this system and the system sensitivity. Dynamic performance of the system was obtained, using a small rocket covered with retroreflective material launched at an acceleration of about 13 g at a point 204 m from the tracker. The daytime sensitivity of the system was checked, using an efficient retroreflector mounted on a light aircraft. This aircraft was tracked out to a maximum range of 15 km, which checked the daytime sensitivity of the system measured by other means. The system also has been used to track passively stars and the Echo 1 satellite. Also, the system tracked passively a +7.5 magnitude star, and the signal-to-noise ratio in this experiment indicates that it should be possible to track a +12.5 magnitude star. (Author)

## A66-25994

### DYNAMIC OPTICAL PATH DISTORTIONS IN LASER RODS.

S. D. Sims, A. Stein, and C. Roth (TRG, Inc., Melville, N. Y.).

Applied Optics, vol. 5, Apr. 1966, p. 621-626.

ARPA-USAF-Navy-supported research.

Review of measurements made of the thermally induced distortions occurring in laser rods resulting from flashlamp heating. Time-resolved interferograms were obtained by placing the sample in a Mach-Zehnder interferometer and using a Q-switched laser as the interferometer illumination source. Significant distortions were observed during the pumping pulse, leading to diverging-lens effects in the sample rods. It is concluded that a Q-switched laser is a highly effective illumination source in cases where high time resolution is desired, and that the results are highly reproducible from shot to shot. B. B.

## A66-25995

### LASER PUMPING BY INTENSE DISCHARGES IN Z-PINCH GEOMETRY.

Rudolf G. Buser and Dietolf Ramm (U. S. Army, Electronics Command, Institute for Exploratory Research, Fort Monmouth, N. J.).

Applied Optics, vol. 5, Apr. 1966, p. 627-631. 9 refs.

Study of the optical properties of high-current, low-pressure noble-gas discharges in z-pinch geometry, and comparison of them with theta-pinch discharges and standard commercial light sources. The circuit of the experimental facility consists of a low inductance

condenser, an air-gap switch, and the discharge tube with provisions for dc preionization, all in coaxial symmetry. The dimensions of the tube are given in a sectional view. Results show that the facility may be useful in systems where high peak power, high repetition rates, or high UV content are demanded. B. B.

## A66-25996

### THERMAL DISTORTION OF DIFFRACTION-LIMITED OPTICAL ELEMENTS.

F. W. Quelle, Jr. (U. S. Navy, Office of Naval Research, Boston, Mass.).

Applied Optics, vol. 5, Apr. 1966, p. 633-637. 12 refs.

Examination of the thermal optical behavior of potential laser materials. The relative sensitivity of these materials to nonuniform energy depositions is discussed, and the thermal optical properties of air, water (at five different temperatures), benzene, ethyl alcohol, and toluene are tabulated. It is found that optical beams can be passed through both water at about -2°C and certain types of glasses such as Pockels glass without suffering serious phasefront distortion when nonuniformities in heat deposition are present. B. B.

## A66-25997

### ANOMALOUS FLUORESCENT DECAY OF LiF:UO<sub>3</sub> UNDER HIGH-INTENSITY EXCITATION.

O. Risgin and A. G. Becker (Michigan, University, Institute of Science and Technology, Ann Arbor, Mich.).

Applied Optics, vol. 5, Apr. 1966, p. 639-641.

Army-sponsored research.

Results from spectroscopic studies of single-crystal LiF:UO<sub>3</sub> (lithium fluoride crystals activated with uranium trioxide) for laser action. While no unambiguous evidence for laser oscillation was observed, the material did show anomalous fluorescent decay under the high-intensity pumping. A 20- to 30- $\mu$ sec micro-spike was exhibited, followed by a period of unusually slow decay. A depopulation mechanism is suggested to explain this effect. R. A. F.

## A66-25998

### EFFECT OF MULTIPLE REFLECTIONS ON THE DESIGN OF AN ELLIPTIC CAVITY FOR SOLID STATE LASERS.

D. Fekete (Grumman Aircraft Engineering Corp., Bethpage, N. Y.).

Applied Optics, vol. 5, Apr. 1966, p. 643-646.

The effects of multiple reflections in an elliptic reflector are investigated. The emphasis is on matching the absorption spectrum of laser crystals to laser pumps by increasing the effective absorption coefficient in areas of low absorption. It is shown that in an ideal case the pump power that would normally be lost, because of a low absorption coefficient of the crystal, can be regained by multiple reflections from a highly reflective elliptic cylinder. This again is somewhat reduced by refraction of the rays by the crystal and flashlamp. An optimum condition for minimizing the refraction losses is derived including the effects of multiple reflections. (Author)

## A66-25999

### DYNAMIC MEASUREMENTS OF PHASE SHIFTS IN LASER AMPLIFIERS.

A. Y. Cabezas, L. G. Komai, and R. P. Treat (Hughes Aircraft Co., Aerospace Group, Culver City, Calif.).

Applied Optics, vol. 5, Apr. 1966, p. 647-651. 6 refs.

USAF-supported research.

Interferometric technique for measuring the optical length variations in laser amplifiers during the pumping and amplification. A 6328-Å He-Ne gas laser was used as a probe source. This method, which uses an oscilloscope presentation of the induced phase shifts, allows for point probing of the optical path variations and affords a continuous record of the dynamic phase shifts. Experimental results indicate that pump-induced phase shifts are predominantly thermal in nature. R. A. F.

**A66-26000****COPYING HOLOGRAMS.**

Franklin S. Harris, Jr., George C. Sherman, and Bruce H. Billings (Aerospace Corp., Los Angeles, Calif.).

Applied Optics, vol. 5, Apr. 1966, p. 665, 666. 10 refs.

Detailed description of a technique successfully used to make photographic copies of holograms taken with laser light. Subjects discussed include film, light source, distance between the hologram and copying emulsions, directional effect, processing, and viewing.

R. A. F.

**A66-26004****THE FM LASER AND OPTICAL COMMUNICATION SYSTEMS.**

J. Richard Kerr (Sylvania Electric Products, Inc., Sylvania Electronic Systems Div., Mountain View, Calif.).

Applied Optics, vol. 5, Apr. 1966, p. 671, 672. 5 refs.

USAF-supported research.

Comparison between FM lasers and optical heterodynes in terms of the usefulness of FM laser outputs as the optical carriers in wideband, direct-detection optical communication systems. The FM He-Ne lasers already developed have nearly as much power output as their free-running, multimode counterparts. As the technique is extended to high-powered CW lasers using such gases as argon, it is expected that much more power will be available than with the single-axial-mode systems. Noise is also expected to be less of a problem with an FM laser than with an optical heterodyne.

R. A. F.

**A66-26006****ON "MICROWAVE MODELS OF OPTICAL RESONATORS."**

Helmut K. V. Lotsch (Northrop Corp., Northrop Space Laboratories, Hawthorne, Calif.).

Applied Optics, vol. 5, Apr. 1966, p. 673, 674. 9 refs.

Analysis of the discrepancies between theoretical and experimental results noted by Checcacci, Scheggi, and Toraldo di Francia in 1965. Experimental studies by Checcacci et al. of the characteristics of a Fabry-Pérot laser resonator with plane reflectors disagreed with the theory of Fox and Li (1961). It is shown that if the experimental results are interpreted instead on the basis of Lotsch's resonator theory, agreement is good. This is seen to indicate that the condition  $d \gg a$  (where  $d$  is the distance between the square reflectors and  $a$  is one half the side of the reflector) is not as stringent as was thought.

R. A. F.

**A66-26019 =****LASER WELDING OF AEROSPACE STRUCTURAL ALLOYS.**

L. P. Earvolino and J. R. Kennedy (Grumman Aircraft Engineering Corp., Bethpage, N. Y.).

(American Welding Society, National Fall Meeting, Birmingham, Ala., Oct. 4-7, 1965, Paper.)

Welding Journal, Research Supplement, vol. 45, Mar. 1966, p. 127-s-134-s.

Analysis of a high-energy-output laser device for use as an industrial tool for the fusion welding of current structural alloys. It is shown that a high-energy, pulsed laser can produce reliable and consistent weld joints in selected materials typical of aerospace structural applications. The evaluation is based mainly on a study of laser welding techniques and procedures, the mechanical properties of weld joints at various temperatures, the mechanism of laser bonding, the metallurgical effects on the base material, and the versatility of the equipment. The equipment, procedure, welding parameters, mechanical testing, and metallographic examination used in laser welding are discussed.

R. A. F.

**A66-26021****OPTICAL EFFECT (AMPLIFICATION OF THE ATOMIC INTERACTION AND COOLING OF THE MEDIUM) IN A LASER BEAM.**

G. A. Askar'ian (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(ZHETF Pis'ma v Redaktsiiu, vol. 3, Feb. 15, 1966, p. 166-170.)

JETP Letters, vol. 3, Feb. 15, 1966, p. 105-107. Translation.

Demonstration that, in some cases, amplification of the interaction of the atoms and of pulsed or periodic cooling of transparent media can be produced by switching on a laser beam. An illustrative mechanism is considered for the change in the kinetic energy of quasi-elastic atoms colliding in a growing homogeneous magnetic field. It is noted that, at the instant when the medium is cooled, virtual complexes and crystalline structures can also be produced periodically, and can be detected by their X-ray scattering, by nonlinear optical effects, etc. Such temperature changes can also be manifested by changes of the effective speeds of the sound waves in a wave train. At low temperatures, noticeable optocaloric effects can arise at lower field intensities in unfocused laser beams, passage of which will be accompanied by pulsed or periodic induced freezing of the medium.

M. M.

**A66-26028****TOTAL ENERGY AND ENERGY DISTRIBUTION IN A LASER CRYSTAL DUE TO OPTICAL PUMPING, AS CALCULATED BY THE MONTE CARLO METHOD.**

D. R. Skinner and J. Tregellas-Williams (Department of Supply, Defence Standards Laboratories, Maribyrnong, Victoria, Australia).

Australian Journal of Physics, vol. 19, Feb. 1966, p. 1-18. 21 refs.

The Monte Carlo technique is applied to discover the total absorbed energy and its distribution within a laser crystal in complex pumping systems not amenable to normal analysis. Allowance is made for: the effects of multiple reflections, both specular and diffuse; modification of Lambert-law emission by refraction at flashlamp envelopes; the effect of laser crystal absorptivity on total absorbed energy; and the use of phosphors for increasing the efficiency of utilization of pump radiation by effectively broadening the crystal absorption bands. The results are in good agreement with previous experimental work and with less comprehensive theoretical treatments of simple systems. The effects of multiple reflections, both specular and diffuse, and of uneven energy distribution on overall laser efficiency are demonstrated quantitatively.

(Author)

**A66-26041****STATISTICAL CHARACTERISTICS OF SELF-MODULATION OF SOLID-STATE LASER RADIATION.**

V. I. Bespalov and A. V. Gaponov (Gor'kovskii Gosudarstvennyi Universitet, Nauchno-Issledovatel'skii Radiofizicheskii Institut, Gorki, USSR).

(Radiofizika, vol. 8, no. 1, 1965, p. 70-80.)

Soviet Radiophysics, vol. 8, Jan.-Feb. 1965, p. 49-56. 10 refs.

Translation.

[For abstract see issue 14, page 2038, Accession no. A65-24809]

**A66-26042****OSCILLATION MODES OF LASERS WITH DIELECTRIC CAVITIES.**

A. N. Oraevskii and V. A. Shcheglov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(Radiofizika, vol. 8, no. 1, 1965, p. 81-90.)

Soviet Radiophysics, vol. 8, Jan.-Feb. 1965, p. 57-62. 10 refs.

Translation.

[For abstract see issue 14, page 2038, Accession no. A65-24810]

**A66-26043****STEADY-STATE LASER OSCILLATIONS WITH DISTRIBUTED LOSSES.**

L. A. Ostrovskii and E. I. Iakubovich (Gor'kovskii Gosudarstvennyi Universitet, Nauchno-Issledovatel'skii Radiofizicheskii Institut, Gorki, USSR).

(Radiofizika, vol. 8, no. 1, 1965, p. 91-97.)

Soviet Radiophysics, vol. 8, Jan.-Feb. 1965, p. 63-67. Translation.

[For abstract see issue 14, page 2038, Accession no. A65-24811]



**A66-26053****OBSERVATION OF THE MULTIBEAM EMISSION OF A HELIUM-NEON GAS LASER.**

Iu. I. Zaitsev and D. P. Stepanov (Gor'kovskii Gosudarstvennyi Universitet, Nauchno-Issledovatel'skii Radiofizicheskii Institut, Gorki, USSR).  
Radiofizika, vol. 8, no. 1, 1965, p. 198, 199.)  
Soviet Radiophysics, vol. 8, Jan.-Feb. 1965, p. 147, 148. Translation.  
 [For abstract see issue 14, page 2038, Accession no. A65-24824]

**A66-26054****EXCITATION PARAMETER OF A BEAM MASER.**

A. F. Krupnov and V. A. Skvortsov (Gor'kovskii Gosudarstvennyi Universitet, Nauchno-Issledovatel'skii Radiofizicheskii Institut, Gorki, USSR).  
Radiofizika, vol. 8, no. 1, 1965, p. 200-203.)  
Soviet Radiophysics, vol. 8, Jan.-Feb. 1965, p. 148-151. 9 refs. Translation.  
 [For abstract see issue 14, page 2038, Accession no. A65-24825]

**A66-26104****APPLICATIONS OF LOW TEMPERATURES IN SATELLITE COMMUNICATIONS.**

H. N. Daglish (General Post Office, Research Station, London, England).  
Institute of Refrigeration, Meeting, National College for Heating, Ventilating, Refrigeration and Fan Engineering, London, England, Nov. 4, 1965, Paper; Journal of Refrigeration, Jan. 1966.)  
ASHRAE Journal, vol. 8, Apr. 1966, p. 63-66. 5 refs.

Description of low-temperature techniques used in current satellite communication systems, the particular temperatures used lying in the range below 77°K. It is pointed out that, although much equipment cooled by one or another liquefied gas is at present in use, there is an increasing trend toward the use of closed-cycle refrigerators. This trend is expected to continue as both reliability and operating life are improved by refrigerator manufacturers. M.M.

**A66-26133 #****NOTE ON LIDAR OBSERVATIONS OF PARTICULATE MATTER IN THE STRATOSPHERE.**

R. T. H. Collis and M. G. H. Ligda (Stanford Research Institute, Menlo Park, Calif.).  
Journal of the Atmospheric Sciences, vol. 23, Mar. 1966, p. 255-257. 8 refs.  
 Research supported by the Stanford Research Institute; Contract No. Nonr-4471(00).

Description of recent observations of the higher atmosphere with an advanced lidar. The characteristics of the Stanford Research Institute Mark II lidar are tabulated. If scattering at 33 km and higher is assumed to be due only to molecular scattering and is used as a datum, the average scattering observed at 19 km is some 1.7 times greater than would be expected from a purely gaseous atmosphere. Because of the consistency of the fluctuations shown on a short-term basis, the present observations show that particulate matter concentrations can occur in the stratosphere in much the same patchy or layered manner as has been observed by lidar in stable conditions in the clear lower atmosphere. This appears to confirm and extend the findings of Bigg, who detected a highly variable stratification of particulate matter in the stratosphere using a twilight scattering technique. M.F.

**A66-26142****OPTICALLY INDUCED MAGNETIZATION RESULTING FROM THE INVERSE FARADAY EFFECT.**

P. S. Pershan, J. P. van der Ziel, and L. D. Malmstrom (Harvard University, Div. of Engineering and Applied Physics, Cambridge, Mass.).  
 IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]  
 Conference sponsored by the Office of Naval Research, Department of the Navy.  
 Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.  
 New York, McGraw-Hill Book Co., 1966, p. 3-12. 8 refs.  
 Research supported by Harvard University; Contract No. Nonr-1866(16).

Observation of magnetization induced by circularly polarized light incident on a nonabsorbing material, in the absence of an external magnetic field, in  $\text{CaF}_2$  crystals doped with  $\text{Eu}^{2+}$ . This effect is called the inverse Faraday effect. The observed sense of the magnetization and its temperature dependence are found to agree between 1.3 and 300°K with the observed sign and temperature dependence, respectively, of the Verdet constant of the material. Additional measurements made on a number of diamagnetic glasses and several organic and inorganic liquids furnish confirmation for the linear dependence of the magnetization on the Verdet constant.

R. A. F.

**A66-26144****SECOND-HARMONIC GENERATION AND PARAMETRIC AMPLIFICATION USING INTENSE UNFOCUSED LASER BEAMS.**

Charles C. Wang and George W. Racette (Philco Corp., Applied Research Laboratory, Blue Bell, Pa.).  
 IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]  
 Conference sponsored by the Office of Naval Research, Department of the Navy.  
 Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.  
 New York, McGraw-Hill Book Co., 1966, p. 20-30. 26 refs.

The theory of second-harmonic generation of light was examined with particular emphasis on the saturation effects occurring at high laser power levels. The nonlinear coupled Maxwell's equations were solved approximately to yield solutions of simple form. The effect of beam divergence was taken into account by averaging the solution over the entire angular spread of the laser beam. The second harmonic thus generated is seen to be proportional to the  $3/2$  power of the laser power independently of the length of the crystal in long crystals. Experimental data in good agreement with the theory are presented. Additionally, the study of optical parametric amplification was undertaken to observe amplification of weak light signal by an intense locally generated light pump. A He-Ne gas laser operating at 6328 Å was used to provide the signal beam, and the second harmonic of a Q-switched ruby laser provided the pump power. With an ADP crystal 8 cm in length and a pump power of 2 Mw, parametric gain of the order of 1 db has been achieved. (Author)

**A66-26145****OPTICAL PARAMETRIC OSCILLATION IN  $\text{LiNbO}_3$ .**

J. A. Giordmaine and Robert C. Miller (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).  
 IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]  
 Conference sponsored by the Office of Naval Research, Department of the Navy.  
 Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.  
 New York, McGraw-Hill Book Co., 1966, p. 31-42. 9 refs.

Discussion of parametric-oscillator theory as applicable to the tunable coherent optical parametric oscillation demonstrated by the authors in  $\text{LiNbO}_3$ . Some further experimental data on the characteristics of lithium niobate are given. Parametric gain and the role of longitudinal modes in parametric oscillation are considered.

R. A. F.

**A66-26146**

NONLINEAR EFFECTS AT MULTIPLES OF LASER FREQUENCIES. S. A. Akhmanov, V. G. Dmitriev, R. V. Khokhlov, and A. I. Kovrygin (Moscow State University, Moscow, USSR).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 43-48. 19 refs.

Results of theoretical and experimental studies of light-frequency multipliers used for studying nonlinear optical effects at wavelengths from 0.2 to 0.7  $\mu$ . Some of the factors influencing the frequency doubling, such as the focusing and the finite divergence of the laser beam, are considered. Air breakdown, stimulated Raman emission, and parametric amplification of light were some of the phenomena observed using harmonics of the basic frequency of a neodymium laser. R. A. F.

**A66-26148**

NONLINEAR LIGHT SCATTERING IN METHANE.

P. D. Maker (Ford Motor Co., Scientific Laboratory, Dearborn, Mich.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 60-66. 6 refs.

Detection of nonlinear light scattering in methane pressurized to 100 atm. This scattering is similar to that observed in liquids by Terhune, Maker, and Savage in 1965. The very weak signal corresponded to a scattering of  $\sim 10^{-15}$  of the incident energy. At the spectral resolution employed ( $\sim 300 \text{ cm}^{-1}$ ) the scattering appeared as a single unresolved spectral line displaced from twice the laser frequency by about  $50 \text{ cm}^{-1}$ . This displacement is found to be consistent with a calculation of the rotational fine structure of the line, neglecting nuclear spin. The deduced value for the second-order polarizability of the methane molecule is an order of magnitude smaller than that calculated theoretically by Buckingham and Stephen. R. A. F.

**A66-26149**

DISPERSION OF THE OPTICAL NONLINEARITY IN SEMICONDUCTORS.

N. Bloembergen (California, University, Dept. of Electrical Engineering and Dept. of Physics, Berkeley, Calif.), R. K. Chang (Harvard University, Div. of Engineering and Applied Physics, Gordon McKay Laboratory, Cambridge, Mass.), and J. Ducuing (Massachusetts Institute of Technology, Dept. of Physics, Cambridge, Mass.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 67-79. 13 refs. Contract No. Nonr-1866(16).

The nonlinear susceptibility describing the second harmonic generation of light has been measured in several semiconductors having zinc-blende ( $\bar{4}3m$ ) symmetry. A rapid variation of  $|\chi^{(2)}_{NL}(2\omega)|$  as a function of frequency is observed over the range from 1.17 to 2.34 eV. When the medium is absorbing at either or both of these frequencies, the nonlinear susceptibility is a complex quantity. The phase of this susceptibility has been measured; thus the real and imaginary parts of the nonlinear susceptibility are completely determined. In this paper, the quantum-mechanical description of the nonlinear susceptibility and the reflection technique for measuring that quantity are reviewed. The technique of sweeping the laser wavelength and of measuring the phase of the complex nonlinear susceptibility are discussed. The experimental results are compared with the theoretical description of the nonlinear susceptibility. (Author)

**A66-26150**

SECOND-HARMONIC GENERATION OF LIGHT FROM SURFACE LAYERS OF MEDIA WITH INVERSION SYMMETRY.

N. Bloembergen (California, University, Dept. of Electrical Engineering, Berkeley, Calif.) and R. K. Chang (Harvard University, Div. of Engineering and Applied Physics, Gordon McKay Laboratory, Cambridge, Mass.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 80-85. 7 refs.

Navy-supported research.

Observation of second-harmonic generation (SHG) by a Q-switched laser pulse from surfaces of silicon and germanium. This effect differs quantitatively and qualitatively - in intensity, polarization, second-harmonic production, and fundamental-field composition - from the SHG in such crystals as GaAs, which lack a center of inversion. It is proposed that the SHG in Ge originates from a single atomic layer at the surface, whereas the much larger effect in GaAs originates from a volume restricted by the absorption depth of the second-harmonic light. It is suggested that the SHG observed by Brown, Parks, and Sleeper in 1965, can be explained by the same theory. R. A. F.

**A66-26153**

PLASMON SCATTERING OF LIGHT AND STIMULATED EMISSION OF PLASMONS IN SOLIDS.

A. L. McWhorter (Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 111-118. 8 refs.

Calculation of the cross section for the inelastic scattering of electromagnetic radiation by electron-density fluctuations in an isotropic solids, using the structure function and dielectric-constant formalism. The results indicate that if laser sources are used, the scattering from both acoustic and optical plasmons should be observable, and that Landau as well as collision damping of the plasmons can be investigated. Criteria for the choice of materials are discussed and possible materials suggested. Threshold conditions for stimulated emission of acoustic and optical plasmons are also derived, but some improvement in far-IR lasers is necessary before such phenomena can be studied experimentally. R. A. F.

**A66-26155**

STIMULATED COMPTON SCATTERING OF ELECTRONS BY LASER BEAM.

L. S. Bartell and H. Bradford Thompson (Iowa State University of Science and Technology, Institute for Atomic Research and Dept. of Chemistry, Ames, Iowa).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 129-133. 11 refs.

Theoretical consideration of the scattering of a beam of electrons by intense standing waves of photons inside a laser cavity, observed by the authors and Roskos in 1965. It is suggested that this scattering corresponds to the stimulated Compton effect predicted by Kapitza and Dirac in 1933. The analogy between this effect and its inverse - the scattering of photons by a periodic lattice of electrons - is discussed together with several experimental observations and possible applications. R. A. F.

**A66-26156****LIGHT WAVES WITH EXPONENTIAL GAIN.**

N. Bloembergen (California, University, Dept. of Electrical Engineering, Berkeley, Calif.) and P. Lallemand (Harvard University, Div. of Engineering and Applied Physics, Gordon McKay Laboratory, Cambridge, Mass.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]  
Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.  
New York, McGraw-Hill Book Co., 1966, p. 137-154. 25 refs.  
ARPA-Navy-supported research.

The coupled-wave formalism is reviewed to give a unified description of parametric down conversion of light, the stimulated Brillouin and Raman effects, stimulated light scattering in plasmas, etc. The exponential character of the gain is emphasized. The feedback in oscillators and the filamentary or multimode structure of the light beams present serious difficulties for quantitative measurements. Some experimental data on the gain in a Stokes amplifier cell are presented. The exponential gain constant for the benzene Stokes line has been measured as a function of polarization and of concentration in liquid mixtures. The relationship to the spontaneous-emission cross section in these cases is discussed.

(Author)

**A66-26157****ANOMALIES IN STIMULATED RAMAN SCATTERING CONVERSION EFFICIENCIES.**

F. J. McClung, W. G. Wagner, and D. Weiner (Hughes Aircraft Co., Research Laboratories, Malibu, Calif.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]  
Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.  
New York, McGraw-Hill Book Co., 1966, p. 155-158. 9 refs.  
Contract No. AF 33(657)-11650.

Observation and discussion of a discrepancy between calculated and experimental values for Raman gain. Using the formula given by Hellwarth in 1963 and a measured peak Raman-scattering cross section of  $1.3 \pm 0.4 \text{ cm}^{-1}$ , the gain in nitrobenzene for a giant-pulse laser at  $20 \text{ Mw/cm}^2$  is computed to be  $0.028 \text{ cm}^{-1}$ . The observed gain is  $0.80 \text{ cm}^{-1}$ . Two alternate hypotheses are suggested as explanations for the discrepancy: (1) that there is a higher energy distribution in the beam due to causes other than multimode effects, such as light trapping; and (2) that some physical effect, such as Brillouin scattering, caused the effective reflectivity in the Raman cell to be much higher than was assumed for the gain calculations. Preliminary checks neither proved nor disproved either hypothesis.

R. A. F.

**A66-26158****EFFECT OF LASER PUMP MODULATION ON STOKES RADIATION IN STIMULATED RAMAN SCATTERING.**

William G. Wagner, Shaul Yatsiv, and Robert W. Hellwarth (Hughes Aircraft Co., Research Laboratories, Malibu, Calif.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]  
Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.  
New York, McGraw-Hill Book Co., 1966, p. 159-166. 10 refs.

A quantitative analysis of the effect of a fluctuating laser pump on stimulated Raman scattering phenomena is undertaken in this paper. The linearized theory of the growth of coupled Stokes-anti-Stokes waves in the presence of a two-mode pump is described. For situations where this coupling can be neglected, which is usually the case for the bulk of the Stokes radiation, a general formula for the growth of the Stokes wave in the presence of an arbitrary spatial-temporal distribution of the pump intensity is presented, which is of great utility on the analysis of experiments. On the basis

of this formula, three predictions about the Stokes light are made. First, in the forward direction the temporal variation of the Stokes flux is correlated directly with the fluctuations in the pump intensity. The Stokes variation is much more severe than the corresponding modulation of the pump. Second, the modulation of the backward Stokes beam should be quite gentle compared to that of the forward beam. Third, the forward-backward power asymmetry is a very sensitive function of short-term fluctuations in the laser pump.

(Author)

**A66-26160****FORWARD EMISSION OF RAMAN RADIATION IN VARIOUS LIQUIDS.**

Georges Bret and Guy Mayer (Compagnie Générale de Télégraphie sans Fil, Département de Physique Appliquée, Orsay, Seine-et-Oise, France).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]  
Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.  
New York, McGraw-Hill Book Co., 1966, p. 180-191. 38 refs.

Forward emission of Raman light was studied in different liquids when illuminated by a parallel laser beam. It was found that feedback of Raman radiation into the liquid is not essential to obtain a strong stimulated Raman action. This implies high gains which cannot be explained by laser mode structure and Raman cross-section asymmetry. A more precise description of Raman action in liquids is given. This description suggests that there exists some other mechanism which contributes strongly to the modulation of the polarizability of the medium.

(Author)

**A66-26161****INDUCED ABSORPTION SPECTRA AT OPTICAL FREQUENCIES.**

A. K. MacQuillan and B. P. Stoicheff (Toronto, University, Dept. of Physics, Toronto, Canada).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]  
Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.  
New York, McGraw-Hill Book Co., 1966, p. 192-199. 16 refs.  
Research supported by the National Research Council of Canada.

Absorption spectra in the optical region have been observed when laser radiation (frequency  $\nu_0$ ) and intense continuous radiation are simultaneously incident on a molecular medium. The absorption lines at  $\nu_0 + \nu_M$  arise from the modulation of the electric-field-induced dipole moment by the molecular frequencies  $\nu_M$  and are the analog of stimulated Raman emission lines at  $\nu_0 - \nu_M$ . The observed spectroscopic characteristics of the induced absorption spectrum of liquid benzene are described. It is shown that the absorption increases linearly with laser power, and values of the absorption coefficient (the analog of gain in stimulated emission) at various powers are determined.

(Author)

**A66-26162****INTERFERENCE BETWEEN STIMULATED BRILLOUIN AND RAMAN SCATTERING.**

Toshio Ito and Hiroshi Takuma (Tokyo, University, Dept. of Pure and Applied Sciences, Tokyo, Japan).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]  
Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.  
New York, McGraw-Hill Book Co., 1966, p. 200-206.

Very strong interaction between stimulated Brillouin and Raman scattering has been found in  $\text{CS}_2$ . In an optical resonator the axis of which is at a small angle of  $0.070 \text{ rad}$  with the exciting laser

beam, stimulated Brillouin scattering has been observed with exciting power which is lower than the threshold value for Raman scattering. The stimulated Brillouin scattering disappears when the laser power is increased so that the Raman first Stokes line is built up strongly in the medium, and reappears when the incident laser beam is increased further so that the Raman Stokes lines are saturated. A theoretical explanation of this interference effect is also given. (Author)

#### A66-26164

##### MULTIPLE STIMULATED BRILLOUIN SCATTERING.

Richard G. Brewer and Donald C. Shapero (International Business Machines Corp., Research Laboratory, San Jose, Calif.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 216-222. 12 refs.

Analysis of the several orders of stimulated Brillouin emission usually exhibited by liquids exposed to the giant pulse of a ruby laser. It is found that (1) these orders are not produced in a single scattering event but appear rather as separate pulses when the time scale of the experiment is expanded; (2) only Stokes orders are identified; and (3) the iteration mechanism suggested by Garmire and Townes in 1964 applies. R.A.F.

#### A66-26165

##### MULTIPLE STIMULATED BRILLOUIN SCATTERING IN SOLIDS.

P. E. Tannenwald (Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 223-230. 8 refs.

Experimental study of stimulated Brillouin scattering in quartz and other solids, using a high-power ruby laser. As many as six successive Brillouin shifts were observed as a result of iterative scattering and reamplification in the ruby rod over at least 3 cm<sup>-1</sup> of the ruby linewidth. Only Stokes waves were generated; this can be understood from considerations of the Brillouin conversion efficiency and ruby gain. R.A.F.

#### A66-26166

##### LIGHT-BEATING TECHNIQUES FOR THE STUDY OF THE RAYLEIGH-BRILLOUIN SPECTRUM.

J. B. Lastovka and G. B. Benedek (Massachusetts Institute of Technology, Dept. of Physics, Spectroscopy Laboratory, and Center for Materials Science and Engineering, Cambridge, Mass.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 231-240. 20 refs. ARPA Contract No. SD-90.

Utilizing the high degree of monochromaticity available in laser light sources it is now possible to obtain information on the velocity and lifetime of microwave thermal phonons in liquids and solids by studying the spectrum of the light scattered from a laser-illuminated sample. However, since the details of the Rayleigh-Brillouin triplet extend only a few gigacycles on either side of the exciting line, high-resolution spectroscopy is required simply to resolve the spectrum. On the other hand, light-mixing techniques, capable of resolutions exceeding 10<sup>13</sup>, are ideally suited to this study. This paper describes two such systems. The first is a "self-beat" or "square-law" spectrometer, an extremely simple method for determining narrow line widths. The second is an optical superheterodyne spectrometer which has been used to detect the Brillouin components in light scattered from toluene. (Author)

#### A66-26168

##### OBSERVATION OF TIME-DEPENDENT DENSITY FLUCTUATIONS IN CARBON DIOXIDE NEAR THE CRITICAL POINT USING AN He-Ne LASER.

S. S. Alpert, D. Balzarini, R. Novick, L. Seigel, and Y. Yeh (Columbia University, Columbia Radiation Laboratory, New York, N.Y.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.

New York, McGraw-Hill Book Co., 1966, p. 253-259. 8 refs.

Contracts No. DA-21-124-ARO(D)-296; No. DA-28-043-AMC-00099(E).

An He-Ne laser homodyne spectrometer has been used to observe the spectrum of 6328 Å light scattered from a carbon dioxide sample maintained near its critical temperature and density. Under these conditions, the spectral profile of the scattered light is broadened by density fluctuations. This broadening was observed experimentally as a function of both scattering angle  $\theta$  and temperature  $T$  in the neighborhood of the critical temperature  $T_c$ . The observed profile was approximately Lorentzian, and for a scattering angle of 10°, the line width was found to narrow linearly with temperature in the range  $0 \leq (T - T_c) \leq 0.026^\circ\text{C}$ . The rate of narrowing was  $4.6 \pm 1.0 \text{ kc}/^\circ\text{C}$ . The line width was further found to be linearly dependent on  $\sin^2(\theta/2)$ . The experimental observations can be interpreted in terms of the macroscopic fluctuation theory developed by Mountain. This theory predicts that the line shape is Lorentzian with a half-width  $\Delta\nu_{1/2} = (4k_B^2/\pi)(\Lambda/c_p\rho_0) \sin^2(\theta/2)$ , where  $\Lambda/c_p\rho_0$  is defined as the thermal diffusivity  $\chi$ . A simple model is used to show that the diffusivity should vary linearly with temperature in the neighborhood of the critical temperature. (Author)

#### A66-26170

##### PHOTON ECHOES IN RUBY.

N. A. Kurnit, I. D. Abella, and S. R. Hartmann (Columbia University, Columbia Radiation Laboratory, New York, N.Y.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.

New York, McGraw-Hill Book Co., 1966, p. 267-279. 9 refs.

Contracts No. DA-31-124-ARO(D)-224; No. DA-28-043-AMC-00099(E).

Theoretical discussion of an optical-frequency echo phenomenon observed by the authors in 1964. Two bursts of radiation incident on a ruby crystal from a suitable ruby laser stimulate radiation from the crystal consisting of three pulses. The first two are the remains of the laser excitation pulse; the third is the "photon echo." This echo phenomenon is explained in much the same way as spin echo, to which it is analogous. R.A.F.

#### A66-26172

##### NONLINEAR QUANTUM EFFECT IN SOLID-STATE MASERS.

Humio Inaba and Hideo Morita (Tohoku University, Research Institute of Electrical Communication, Sendai, Japan).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.

New York, McGraw-Hill Book Co., 1966, p. 294-304. 18 refs.

This paper reports experimental and theoretical studies on the nonlinear quantum effect in microwave solid-state masers using paramagnetic crystals. The novel features exhibiting the complex dependence of the gain characteristics upon the pumping power were observed in both Cr-doped rutile and ruby masers operated at X band. The theoretical analysis allows the conclusion that the experimental result is mainly due to the multiple quantum transition corresponding to the Raman process involved in the three-level maser system. (Author)

**A66-26173****MECHANISMS OF OPTICAL EMISSION FROM RUBY EXCITED BY SHORT PULSES OF RELATIVISTIC ELECTRONS.**

D. M. J. Compton, J. F. Bryant, and R. A. Cesena (General Dynamics Corp., General Atomic Div., John Jay Hopkins Laboratory for Pure and Applied Science, San Diego, Calif.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.

New York, McGraw-Hill Book Co., 1966, p. 305-314. 10 refs.

Contracts No. AF 19(628)-2926; No. AF 33(657)-11696.

Optical emission from ruby excited by short pulses of relativistic electrons has been studied. The emission is chiefly in the R lines, which show an increased width for some  $5 \times 10^{-5}$  sec after a pulse: this increase is attributed to short-lived electronic perturbations rather than to a rise in equivalent temperature of the  $\text{Cr}^{3+}$  ion. The mechanism of excitation of the emission appears to be by recombination of radiation-produced electrons and holes at the  $\text{Cr}^{3+}$  ions rather than by optical excitation by light emitted from the host crystal or by direct inelastic collisions of secondary electrons with the  $\text{Cr}^{3+}$  ions. (Author)

**A66-26174****EFFECTS OF EXCITED-STATE ABSORPTION ON A RUBY LIGHT AMPLIFIER.**

C. S. Naiman, B. DiBartolo (Mithras, Inc., Cambridge, Mass.), and A. Linz (Massachusetts Institute of Technology, Cambridge, Mass.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.

New York, McGraw-Hill Book Co., 1966, p. 315-321. 12 refs.

Contracts No. AF 19(628)-2395; No. AF 33(615)-2885.

Discussion of an experiment which demonstrates the anomalous and temperature-dependent absorption behavior of a pumped ruby rod. It was found that a light pulse sent by a ruby laser through an unsilvered ruby rod pumped with an FT-524 helical flashtube was amplified when both laser rod and unsilvered rod were at room temperature, but was attenuated when the laser rod was at room temperature and the unsilvered rod was at the temperature of liquid nitrogen. The possible states which could be involved in the excited-state absorption are considered. The phenomenon of anomalous absorption behavior is interpreted as being due to excited-state effects, which is consistent with polarization-selection rules and the experimental results. The thermal effect is attributed mainly to the temperature dependence of the bandwidth and the thermal shift. D. P. F.

**A66-26175****ENERGY TRANSFER FROM  $\text{Cr}^{3+}$  TO  $\text{Nd}^{3+}$  IN SOLIDS.**

R. C. Ohlmann and R. Mazelsky (Westinghouse Electric Corp., Research Laboratories, Pittsburgh, Pa.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.

New York, McGraw-Hill Book Co., 1966, p. 322-331. 10 refs.

ARPA-Navy-DOD-sponsored research.

Transfer of excitation radiation from  $\text{Cr}^{3+}$  to  $\text{Nd}^{3+}$  ions in  $\text{LaAlO}_3$ ,  $\text{Y}_3\text{Al}_5\text{O}_{12}$ , and  $\text{GdAlO}_3$  has been observed by means of excitation and fluorescence spectroscopy. Detailed studies of the rate of this energy transfer in  $\text{GdAlO}_3$  show that most of the transfer occurs much more rapidly than the 130- $\mu\text{sec}$   $\text{Nd}^{3+}$  decay rate. However, data indicate that energy transfer also proceeds at a slow rate involving (1) nonradiative transfer from the  $^2\text{E}$  level of  $\text{Cr}^{3+}$ , (2) transfer from  $\text{Cr}^{3+}$  dimers, and (3) transfer from the vibronic levels of  $\text{Cr}^{3+}$ . A comparison is drawn between the results obtained using the three host materials. Implications of these transfer processes for increasing laser efficiency are discussed. (Author)

**A66-26177****FAR-INFRARED SOLID-STATE MASERS - A SPECULATIVE ACCOUNT WITH SOME RELATED EXPERIMENTS.**

F. Varsanyi (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.

New York, McGraw-Hill Book Co., 1966, p. 370-375. 6 refs.

Review of possibilities for nonequilibrium population buildup in far-IR solid-state masers and the methods for the detection of such population in the  $1\text{-cm}^{-1}$  to  $4000\text{-cm}^{-1}$  region. The observation of IR optical double resonance in  $\text{LaCl}_3$  is discussed. Three regions are examined (1) the region just above conventional microwave frequencies; (2) frequencies above the Debye cutoff; and (3) frequencies above all phonons, both acoustical and optical. D. P. F.

**A66-26179****ELECTRON-BEAM EXCITATION OF SEMICONDUCTOR LASERS.**

C. Benoit à la Guillaume and J. M. Debever (Paris, Université, Ecole Normale Supérieure, Laboratoire de Physique, Paris, France).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.

New York, McGraw-Hill Book Co., 1966, p. 397-410. 17 refs.

This paper presents further results on the electron-beam excitation of Te and of pure and n-type doped InSb. In Te we obtained emission polarized with E  $\perp$  c and a value for the E  $\perp$  c band gap at  $4^\circ\text{K}$  of  $334 \pm 1$  meV, which is the same as the E  $\parallel$  c band gap and indicates that the gap is a direct one. Stimulated emission is obtained with threshold currents for 15-keV electrons in the range of 50  $\text{ma/cm}^2$  at  $4^\circ\text{K}$  and 500  $\text{ma/cm}^2$  at  $77^\circ\text{K}$ . Low thresholds are obtained especially on hexagonal needles of Te. In pure InSb, stimulated emission is obtained over a large energy range (232 to 255 meV), depending on the length of the cavity. The stimulated emission involves tail states in the conduction band in long samples and states rather high in the band in short samples. A possible interpretation in terms of valence-band structure is proposed. Low threshold currents in the range of 10  $\text{ma/cm}^2$  (corresponding to an equivalent hole-electron pairs current of about 200  $\text{amp/cm}^2$  obtained at  $4^\circ\text{K}$  on 1- to 2-mm-long samples of pure or  $4 \times 10^{16} \text{ cm}^{-3}$  n-type InSb. A large increase of the threshold current is observed above  $20^\circ\text{K}$ . (Author)

**A66-26180****QUANTUM OSCILLATOR AND AMPLIFIER INVESTIGATIONS.**

N. G. Basov (Academy of Sciences, Institute of Physics, Moscow, USSR).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.

New York, McGraw-Hill Book Co., 1966, p. 411-423. 29 refs.

Summary of the experimental results obtained with a quantum generator and amplifier concerning Q-switched lasers, the interaction of a high-power light pulse with matter, and semiconductor lasers pumped with both optical radiation and electron beams. The stable synchronization and fast operation obtainable when using Kerr cells as shutters is discussed. Two techniques used in heating a plasma by laser radiation are described. The effects of optically pumped semiconductor lasers are considered including the coherent summation of several independently operating optical lasers. Investigations on the oscillation of a CdS semiconductor excited by fast electrons at helium temperatures are described. D. P. F.

**A66-26181****THE EXCITATION MECHANISM IN ELECTRON-BEAM PUMPED LASERS.**

Claude A. Klein (Raytheon Co., Research Div., Waltham, Mass.).  
IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]  
Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.  
New York, McGraw-Hill Book Co., 1966, p. 424-434. 15 refs.

Description of the energy-dissipation pattern of fast electrons in terms of the backscattered energy fraction and differential energy loss, and an evaluation of the average energy dissipated in the production of a single electron-hole pair. Bethe's model, which considers the energy absorbed by an elemental spherical cell of radius  $r$ , is used in calculating the backscattered energy fractions and the differential energy losses. It is shown that in producing electron-hole pairs by means of electron-beam-pumped techniques, the fraction of absorbed beam energy dissipated to photons amounts to 66% in GaAs. It should not be overlooked that electron scattering and phonon emission are intrinsic features of electron-beam pumping, and that they impose severe limitations on the efficiency of this technique.

D. P. F.

**A66-26182****LASER EMISSION BY OPTICAL PUMPING OF SEMICONDUCTORS.**

R. J. Phelan, Jr. (Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]  
Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.  
New York, McGraw-Hill Book Co., 1966, p. 435-441. 5 refs.

Description of experiments on photoluminescence studies and stimulated emission using optical pumping of homogeneous semiconductor materials. A GaAs diode laser and an InSb sample were mounted on copper heat sinks cooled to about 10°K. A narrow strip of material is pumped between two faces cleaved at right angles to the pumped surface. A quartz lens is used to achieve higher power densities. By varying the impurity concentration of InSb the emission lines associated with laser action are clearly identified. With applied magnetic fields laser emission from two spin states were obtained. For diodes a magnetic field applied parallel to the current also resulted in an increase in the spontaneous emission intensity.

D. P. F.

**A66-26183****SATURATION IN SEMICONDUCTOR ABSORBERS AND AMPLIFIERS OF LIGHT.**

Frank Stern (International Business Machines Corp., Thomas J. Watson Research Center, Yorktown Heights, N.Y.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]  
Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.  
New York, McGraw-Hill Book Co., 1966, p. 442-449. 12 refs.  
Army-supported research.

The steady-state variation of light intensity with distance is considered for monochromatic light traversing a homogeneous semiconductor or the active layer of a semiconductor laser amplifier. Since the electronic states which participate lie in a continuum, the formalism is modified somewhat from the well-known results for transitions between discrete levels. At a given point the absorption coefficient  $\alpha$  is a function of the degree of excitation  $S = \Delta n/n_g$  of the electronic system. Here  $\Delta n$  is the concentration of excited electrons or holes (we neglect trapping), and  $n_g$  which is a function of a high-power light pulse with matter, and semiconductor lasers pumped with both optical radiation and electron beams. The

stable synchronization and fast operation obtainable when using Kerr cells as shutters is discussed. Two techniques used in heating a plasma by laser radiation are described. The effects of optically pumped semiconductor lasers are considered including the coherent summation of several independently operating optical lasers. Investigations on the oscillation of a CdS semiconductor excited by fast electrons at helium temperatures are described.

D. P. F.

**A66-26184****LASER ACTION IN GALLIUM ANTIMONIDE DIODES.**

R. Eymard, G. Duraffourg, C. Chipaux, and M. Bernard (Centre National d'Etudes des Télécommunications, Issy-les-Moulineaux, Seine, France).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]  
Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.  
New York, McGraw-Hill Book Co., 1966, p. 450-457. 5 refs.

Further investigation of the laser action observed in GaSb diodes by Chipaux, Duraffourg, Loudette, Noblanc, and Bernard in 1964. Studies of the emitted-light spectrum vs injected current at various temperatures evidence stimulated emission of radiation and oscillation at optical frequencies in GaSb grown p-n junctions. Scanning of the emitting region of the diode shows that emission is not homogeneous. Emission takes place along filaments with diameters estimated to be between 15 and 20  $\mu$ . The observed mode structure is considered to be the superposition of equally spaced axial modes belonging to two different filaments having either a slightly different index of refraction or a slightly different cavity length. The radiative efficiency is considered.

R. A. F.

**A66-26185****MAGNETOEMISSION STUDIES OF PbS, PbTe, AND PbSe DIODE LASERS.**

J. F. Butler and A. R. Calawa (Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]  
Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.  
New York, McGraw-Hill Book Co., 1966, p. 458-466. 12 refs.

Spontaneous and coherent emission from PbS, PbTe, and PbSe diode lasers in [100] oriented magnetic fields has been studied. From measurements of splitting, rate of shift to higher energies, and polarization, spontaneous emission peaks are identified with transitions between sublevels of spin-split zero-order Landau levels. Band-edge parameters determined from these measurements are in agreement with published values, and the previously unpublished value of 29 is obtained for the magnitude of the valence and conduction band [100] g-factors in PbTe. Above threshold, mode shifting due to a dependence of the refractive index on magnetic field is observed and the change in refractive index with [100] magnetic field,  $(\partial n / \partial H[100])_E$ , calculated.

(Author)

**A66-26189****FIELD EMISSION FROM ATOMS IN INTENSE OPTICAL FIELDS.**

Eugene R. Peressini (Aerospace Corp., El Segundo, Calif.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]  
Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.  
New York, McGraw-Hill Book Co., 1966, p. 499-508. 11 refs.

The observation of atomic ionization by means of an intense optical field is reported. The experiments were performed using a single-frequency giant-pulse ruby laser capable of producing a power flux of 1 Gw/cm<sup>2</sup> in a quarter-inch beam which was focused between two collecting electrodes in a cell containing an inert gas at a pressure of 0.3 mm Hg. A prompt electron pulse was collected

which contained no more electrons than there were atoms in the focal volume. The general features of the observed effect can be accounted for on the basis of a field-emission description in which the sinusoidal variation of the optical field is treated adiabatically. (Author)

**A66-26190****ELECTRICAL BREAKDOWN OF GASES BY OPTICAL FREQUENCY RADIATION.**

Alan F. Haught, Russell G. Meyerand, Jr., and David C. Smith (United Aircraft Corp., Research Laboratories, East Hartford, Conn.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16] Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 509-519. 9 refs. ARPA-Navy-DOD-supported research.

The electrical breakdown of gases by high-intensity optical frequency radiation has been studied in a number of gases over the pressure range from 1 atm to 2000 psi with both ruby and neodymium laser radiation. Studies of the attenuation of the incident laser beam have been carried out, and it has been established that the energy removed from the optical beam is not scattered at the laser frequency or reradiated by excited atoms but instead is truly absorbed by the breakdown plasma. The effects of diffusionlike losses on the breakdown threshold have been examined by varying the focal volume within which the breakdown is formed. Experimentally, the breakdown threshold is inversely related to the dimensions of the focus volume, indicating that diffusionlike losses are present and play a significant role in the development of optical frequency breakdown. Studies of the focal volume dependence with neodymium irradiation show that for the larger focal volumes there is a pronounced minimum in the breakdown threshold vs pressure curves. Measurements for a given gas and focal volume were made with both ruby and neodymium radiation to determine the frequency dependence of the breakdown.

(Author)

**A66-26191****THE BREAKDOWN OF NOBLE AND ATMOSPHERIC GASES BY RUBY AND NEODYMIUM LASER PULSES.**

Richard G. Tomlinson, Edward K. Damon, and Harold T. Buscher (Ohio State University, Dept. of Electrical Engineering, Antenna Laboratory, Columbus, Ohio).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16] Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 520-526. 5 refs. Contract No. AF 33(615)-2287.

Breakdown threshold data in xenon, krypton, argon, neon, helium, oxygen, nitrogen, air, and carbon dioxide for ruby and neodymium laser radiation over a pressure range from 100 to 2500 Torr are presented. The thresholds in the noble gases were found to be related to ionization potential and inversely related to maximum effective collision probability. Experimental observations were made which indicated a threshold behavior for laser-induced gas breakdown and which were compatible with a model of the breakdown in which ionization is initiated early in the pulse, possibly by multiphoton ionization, and grows in a cascade collision process to visible discharge densities. The ionization apparently does not depend on a resonant phenomenon and is directly related to optical power density and collision probability and inversely related to laser frequency.

(Author)

**A66-26192****INVESTIGATION OF OPTICAL FREQUENCY BREAKDOWN PHENOMENA.**

R. W. Minck and W. G. Rado (Ford Motor Co., Scientific Laboratory, Dearborn, Mich.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16] Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 527-537. 13 refs.

Results from an experimental study of gas breakdown by optical beams. It is shown that a minimum exists in the threshold-vs-pressure plot at high pressure. The variation of threshold with focal diameter is seen to demonstrate the importance of diffusion losses. Through the use of high gas pressures, the plasma can be made dense enough ( $>10^{21}$  cm $^{-3}$ ) to result in plasma resonance and reflection of the optical beam.

R. A. F.

**A66-26193****THEORY OF GROWTH OF IONIZATION DURING LASER BREAKDOWN.**

A. V. Phelps (Westinghouse Electric Corp., Research Laboratories, Pittsburgh, Pa.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16] Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 538-547. 32 refs. USAF-supported research.

Theoretical calculations are made of the rate of growth of ionization by electron impact with atoms and molecules in the presence of an intense laser beam. The excitation and ionization coefficients are calculated using Holstein's formula for the free-free absorption coefficient and using previously determined elastic and inelastic-scattering cross sections. The agreement with experimental measurements of the time of breakdown is satisfactory if one assumes that initiating electrons are readily produced by the laser and that some of the atoms or molecules excited by electron impact are immediately photoionized.

(Author)

**A66-26194****OPTICAL FREQUENCY ELECTRICAL DISCHARGE IN AIR.**

S. L. Mandelstam, P. P. Pashinin, A. M. Prokhorov, and N. K. Sukhodrev (Academy of Sciences, Institute of Physics, Moscow, USSR).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16] Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 548-553. 12 refs.

Investigation of the last two stages of the breakdown induced in air by a giant-pulse ruby laser (output energy, 2 joules; pulse duration, 30 nsec). These two stages are the quasi-stationary stage and the afterglow. The plasma temperature was determined by studying the X radiation of the spark in the wavelength region near 10 Å. The ionization front of the laser-induced spark was observed to have an ordered motion toward the lens. Three possible mechanisms - the hydrodynamic process proposed by Ramsden in 1964, the light-heating process, and a breakdown threshold wave - are suggested for this motion. It is considered that the hydrodynamic mechanism was predominant under the observed conditions.

R. A. F.

**A66-26195****FAR-INFRARED MASERS AND THEIR APPLICATIONS TO SPECTROSCOPY.**

C. G. B. Garrett (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).  
 IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]  
 Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.  
 New York, McGraw-Hill Book Co., 1966, p. 557-566. 13 refs.

General discussion of lasers - both rare-gas and molecular - operating in the far infrared. The present developmental state of far-IR lasers is reviewed. Ways in which the coherence of the laser signal can be taken advantage of and applied to spectroscopic research are suggested. Some possible nonlinear optics experiments in the far infrared are considered.

R.A.F.

#### A66-26196

##### SPECTROSCOPY WITH GAS LASERS.

M. S. Feld, J. H. Parks, H. R. Schlossberg, and A. Javan (Massachusetts Institute of Technology, Dept. of Physics, Cambridge, Mass.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]  
 Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.  
 New York, McGraw-Hill Book Co., 1966, p. 567-580. 11 refs.  
 USAF-NASA-supported research.

Theoretical consideration of optical- and infrared-laser techniques which are particularly applicable to spectroscopic studies of inhomogeneously broadened resonances. Primary attention is given to effects which are not associated exclusively with standing-wave fields.

R.A.F.

#### A66-26197

##### TUNED-LASER SPECTROSCOPY OF ORGANIC VAPORS.

Hendrik J. Gerritsen (Radio Corporation of America, RCA Laboratories, Princeton, N.J.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]  
 Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.  
 New York, McGraw-Hill Book Co., 1966, p. 581-590. 5 refs.

Discussion of the principle and realization of a tuned-laser spectroscopy. Details of the construction and operation of a magnetically tunable  $3.39\text{-}\mu$  gas laser are reviewed, useful resolution is considered and spectra of several organic vapors are shown with a  $10^6$  resolution. In particular, results of an investigation of methane are given. Absolute collision diameters in methane-other gas mixtures were obtained from the broadening of the absorption line, and nonlinear absorption was observed by focusing a 25-Mw laser beam in methane gas. An order-of-magnitude value was obtained for the vibrational deactivation process by measuring the ratio between IR power absorbed from the laser beam and that re-emitted by spontaneous emission. Knowledge of the fluorescent lifetime leads to the computation that about one in ten collisions leads to deactivation.

B. B.

#### A66-26198

##### A REVIEW OF RECENT STUDIES OF PRESSURE EFFECTS ON THE EXCITED STATES OF Ne USING AN He-Ne LASER LIGHT SOURCE.

R. H. Cordover, J. Parks, A. Szöke, and A. Javan (Massachusetts Institute of Technology, Dept. of Physics, Cambridge, Mass.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.  
 New York, McGraw-Hill Book Co., 1966, p. 591-601. 18 refs.  
 NASA-USAF-supported research.

We have used an He-Ne laser in a variety of ways to study the influence of pressure on the line shape of some of the  $2s\text{-}2p$  optical transitions of Ne. The technique used in these experiments consists of (1) detailed study of pressure effects on the power output of a single-mode maser as a function of its oscillation frequency; (2) experiments using the Hanle effect and double resonance in the presence of maser oscillation and also in a simple discharge tube without an optical maser field; and (3) study of collision-induced nonradiative transitions with the group of  $2s$  levels of Ne. In Experiment 1 the hard and soft collisions have been studied in detail together with pressure-induced asymmetry in the line shape. Because of this asymmetry, maximum saturation does not appear at the peak of the Doppler resonance, resulting in a shift of the minimum of the Lamb dip. In Experiment 2, the natural line shape is observed as a function of pressure. The measured cross sections for hard collisions are in agreement and give complementary information to that obtained in Experiment 1. In Experiment 3, the collision-induced diffusion of population within a group of closely spaced levels of Ne is studied when a sizable change of population is induced in one of the members of the group by means of an applied optical maser field.

(Author)

#### A66-26199

##### PRESSURE EFFECTS IN THE OUTPUT OF A GAS LASER.

B. L. Gyorffy and W. E. Lamb, Jr. (Yale University, New Haven, Conn.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]  
 Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.  
 New York, McGraw-Hill Book Co., 1966, p. 602-610. 11 refs.  
 NASA-USAF-supported research.

Consideration of the model for a laser oscillator which consists of a lossy cavity of the Fabry-Pérot type driven by thermally moving two-level atoms. Both atomic states are assumed to be decaying to some unspecified ground state at rates  $\gamma_a$  and  $\gamma_b$ , respectively. The velocity distribution of the atoms is taken to be Maxwellian, and it is further assumed that they do not collide during time intervals comparable to  $\gamma_a^{-1}$ ,  $\gamma_b^{-1}$ . The treatment of the single-mode case is generalized in order to include the effects of collisions between the atoms of the active medium.

B. B.

#### A66-26200

##### MULTIPLE QUANTUM PROCESSES IN MAGNETIC FIELD-TUNED OPTICAL MASERS.

R. L. Fork and M. Sargent, III (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]  
 Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax.  
 New York, McGraw-Hill Book Co., 1966, p. 611-619. 6 refs.

A physical interpretation of the terms appearing in mode amplitude and frequency-determining equations for a magnetic field-tuned gaseous optical maser is given in terms of multiple quantum processes. A saturation of the individual Zeeman resonances which has a character similar to the central tuning dip saturation in zero field optical masers is described as well as a competition between



orthogonally polarized modes which arises from a process referred to by Javan as a "coherent double-quantum transition." Plots of the saturated velocity distribution are given including a display of velocity regions in which the atoms possess an induced rotating moment. A comparison of the processes described with those occurring in the well-known optical double resonance is made. (Author)

**A66-26201****ZEEMAN EFFECTS IN AN He-Ne LASER.**

P. T. Bolwijn (Utrecht, Rijksuniversiteit, Fysisch Laboratorium, Utrecht, Netherlands).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 620-625. 11 refs.

Measurements of the dependence of the Zeeman beat frequency on the interferometer tuning in a single-mode He-Ne laser with various total gas pressures. Axial magnetic field strengths used ranged from 1 up to 30 oe. The total gas pressure was varied from 1.5 up to 10 mm Hg. In addition, the dependence of beat frequency on magnetic field strength was studied. The results suggest that an interaction between the two circularly polarized Zeeman oscillations occurs, especially at low pressures and high excitation levels.

M. F.

**A66-26202****LIGHT SHIFT, LIGHT MODULATION, AND PHASE PULLING IN THE OPTICALLY PUMPED RUBIDIUM MASER.**

R. Novick, P. Davidovits, W. Happer, Jr., and W. A. Stern (Columbia University, Columbia Radiation Laboratory, New York, N. Y.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 626-634. 5 refs. Contracts No. DA-28-043-AMC-00099(E); No. Nonr-4259(10).

Account of detailed studies of the light shift observed in the optically pumped rubidium maser, discussing the possibility of observing microwave modulation of the pumping light and proposing a novel method for monitoring frequency pulling effects. The frequency shifts have been correlated with high-resolution spectral observations of the pumping light. The observed shifts are in qualitative agreement with the theory of Barrat et al. A theoretical study has been made of the light absorption process. It has been shown that in the case of the field independent (0-0) maser the absorption coefficient for circularly polarized rubidium resonance radiation propagation along the direction of the static magnetic field is modulated at the maser frequency. This result is interpreted to indicate that the pumping light becomes modulated on passing through the maser even though the fluorescent radiation is quenched by the nitrogen buffer gas. It is shown that the phase of the modulated optical absorption relative to that of the microwave maser field depends critically on the maser frequency.

M. F.

**A66-26203****THERMALLY PUMPED INFRARED MASERS.**

Koichi Shimoda (Tokyo, University, Dept. of Physics, Tokyo, Japan).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 635-642. 6 refs.

The possibility of maser action on vibrational transitions of thermally pumped polyatomic molecules is discussed. The vibrational relaxation time is very much longer than the average time

between successive collisions in the gas. Each vibrational level shows a different relaxation time, which is generally longer when the vibrational frequency is higher. During the thermal relaxation of molecules which are drifting from the hot wall toward the cold wall, the upper vibrational level may become more populated than the lower vibrational level. A theory of vibrational relaxation of Maxwellian molecules which are moving between hot and cold parallel plates is briefly described. The  $(0\ 0^0\ 1) \rightarrow (1\ 0^0\ 0)$  transition of carbon dioxide is particularly discussed. With the high and low temperatures of 1400 and 1400°K the maser gain at a wavelength near  $10.6\ \mu$  is calculated to be about 1.5% per meter at optimum pressure. (Author)

**A66-26204****VIBRATION ENERGY TRANSFER - AN EFFICIENT MEANS OF SELECTIVE EXCITATION IN MOLECULES.**

C. K. N. Patel (Bell Telephone Laboratories, Inc., Murray Hill, N. J.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 643-654. 16 refs.

In this paper we discuss the problem of obtaining selective excitation of molecules in order to obtain efficient and strong laser action on vibrational-rotational transitions. After considerations of various possible means we show that vibrational energy transfer is an excellent method for achieving the selective excitation. In particular, homonuclear diatomic molecules excited to a vibrational level of their ground electronic states can be ideal "pumping" molecules because of the long lifetimes of these vibrational levels. We analyze an  $N_2$ - $CO_2$  laser and show that this laser is capable of producing high CW power output on the  $00^01$ - $10^00$  vibrational-rotational transitions of  $CO_2$ . The excitation process involves the transfer of vibrational energy of  $N_2^*(v=1)$  to  $CO_2$  with resultant selective excitation of  $CO_2$  to the upper laser level. Experiments on this laser have shown that addition of certain other gases can improve laser action. Thus with  $PN_2 = 1.0$  torr,  $P_{air} = 1.0$  torr,  $PCO_2 = 0.4$  torr, and  $PH_2O = 0.04$  torr, a CW laser power output of 16.2 watts was obtained on three rotational transitions (near  $10.6\ \mu$ ) belonging to the  $00^01$ - $10^00$  vibrational band of  $CO_2$ . DC power required to excite the discharge was 400 watts. We give details of the experiment and some remarks on possible roles played by the impurities in assisting the laser action. (Author)

**A66-26206****EXCITATION MECHANISMS OF THE ARGON-ION LASER.**

E. I. Gordon, E. F. Labuda, Richard C. Miller, and C. E. Webb (Bell Telephone Laboratories, Inc., Murray Hill, N. J.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16]

Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 664-673. 7 refs.

Study of the excitation mechanism of continuously operating or long-pulse argon-ion lasers. After considerable experimental investigation, it appears that the mechanism of direct excitation by electron impact on the ion ground state or highly populated ion metastable levels, originally proposed, is most appropriate. Other excitation mechanisms are reviewed and the influence of axial magnetic fields is studied. It has been predicted and observed that large axial magnetic fields will enhance the axial charged particle density. It is concluded that the most significant factor in the magnetic field enhancement of the pumping rate is the increase in charged particle density. The magnetic field measurements lend further support to the simple excitation mechanisms described. M. F.

**A66-26207****TRANSITION PROBABILITIES, LIFETIMES AND RELATED CONSIDERATIONS IN IONIZED ARGON LASERS.**

H. Statz, F. A. Horrigan, S. H. Koozekanani (Raytheon Co., Research Div., Waltham, Mass.), C. L. Tang (Cornell University, School of Electrical Engineering, Ithaca, N.Y.), and G. F. Koster (Massachusetts Institute of Technology, Dept. of Physics, Cambridge, Mass.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16] Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 674-687. 22 refs.

Calculation of lifetimes of the various Ar II levels which are shown to be consistent with observed population inversions. Further more, it is shown that excitation via cascade transitions preferentially populates those upper laser states which emit the strongest lines. Transition probabilities between the various maser transitions are calculated in the intermediate coupling approximation. Power-limiting radiation-trapping effects are estimated. M.F.

#### A66-26208

EMISSION-LINE WIDTHS OF ION LASERS.

A. L. Bloom, R. L. Byer, and W. E. Bell (Spectra-Physics, Inc., Mountain View, Calif.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16] Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 688, 689. Army-supported research.

Study of high-resolution interferometry performed on visible ion laser transitions in CW argon, krypton, and xenon lasers, and on a pulsed mercury-helium laser. Results for the total laser Doppler widths (full width at half maximum) are as follows: Ar<sup>+</sup> at 4880 Å, 3.8 Gc; Kr<sup>+</sup> at 4846 Å, 2.4 Gc; Xe<sup>+</sup> at 4603 Å, 1.66 Gc; Hg<sup>+</sup> at 6150 Å, 0.50 Gc. Zeeman splitting by a longitudinal magnetic field has been studied in the case of the noble gas ion lasers. M.F.

#### A66-26209

ION LASER OSCILLATIONS IN SULFUR.

H. G. Cooper and P. K. Cheo (Bell Telephone Laboratories, Inc., Whippany, N.J.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16] Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 690-697. 10 refs.

Study of laser oscillations from S II, S III, and S V in the wavelength range 2600 to 5900 Å obtained in pulsed SO<sub>2</sub>, SF<sub>6</sub>, and H<sub>2</sub>S discharges. Threshold current for the 5454 Å S II transition is comparable to that for the 4880 Å Ar II line in the same cavity structure. Quenching of laser emission at high currents and influence of the various polyatomic parent discharges on laser action are discussed. M.F.

#### A66-26210

INTENSITY FLUCTUATIONS AND CORRELATIONS IN A GaAs LASER.

J. A. Armstrong and Archibald W. Smith (International Business Machines Corp., Thomas J. Watson Research Center, Yorktown Heights, N.Y.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16] Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 701-705.

Observation of the intensity fluctuations in the light from individual lasing and nonlasing modes of a CW GaAs laser. These fluctuations were studied as the injection current was varied through threshold; it was therefore possible to observe the change in noise properties of the laser emission which occurs at threshold. Also observed were correlations between the intensity fluctuations in separate modes. The measurements were made using the coincidence-counting technique of intensity interferometry and, independently, using the single-detector method of excess photon noise. The quantitative agreement between the two methods of measuring the fluctuations was excellent. M.F.

#### A66-26211

AMPLITUDE NOISE IN GAS LASERS BELOW AND ABOVE THE THRESHOLD OF OSCILLATION.

Charles Freed (Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.) and Hermann A. Haus (Massachusetts Institute of Technology, Dept. of Electrical Engineering and Research Laboratory of Electronics, Cambridge, Mass.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16] Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 715-724. 8 refs. Contract No. DA-36-039-AMC-03200(E).

Information on higher-order correlation functions of the light power of a narrow-band source can be obtained from measurements of the photoelectron counts of a photomultiplier illuminated by the light. Experiments are reported here in which photoelectron counts within preset time intervals of adjustable duration T were recorded. The lowest four factorial moments of the photoelectron counts were evaluated. The experimental results are compared with the predictions of photoemission theory. A helium-neon internal-mirror laser operating at 6328 Å was used as the light source. Theory predicts different dependences upon T of the higher-order factorial moments produced by light from a laser below and above threshold. The theoretical predictions are in good agreement with the experiments. (Author)

#### A66-26212

A STUDY OF THE YAG:Nd OSCILLATOR.

J. E. Geusic, H. M. Marcos, and L. G. Van Uitert (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16] Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 725-734. 10 refs. Contract No. DA-36-039-AMC-02333(E).

Study of two facets of work on YAG:Nd which relate to fundamental laser oscillator theory. First, the stability of the YAG:Nd oscillator has made it possible to verify experimentally that this oscillator can be described, above and below threshold, as a regenerative amplifier of noise. Above threshold, in what is considered the region of oscillation, it is a saturated regenerative amplifier of noise. Second, the amplitude fluctuations of the YAG:Nd oscillator were studied by the single-detector method and the preliminary results were found to agree with theoretical predictions. M.F.

#### A66-26213

QUANTUM NOISE. V - PHASE NOISE IN A HOMOGENEOUSLY BROADENED MASER.

Melvin Lax (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16] Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 735-747. 29 refs.

Quantum mechanical, nonlinear analysis of (1) the steady motion of a laser, (2) the stability under deviations from this steady motion, and (3) the influence of noise in determining line width and intensity fluctuations. The noise is shown to be inversely proportional to the number of photons in the system, so that the mean motion above threshold of the laser system (in the absence of noise) is essentially unaffected by noise and can be dealt with in an entirely classical fashion.

R.A.F.

**A66-26214****QUANTUM THEORY OF THE LASER.**

Victor Korenman (Harvard University, Lyman Laboratory of Physics, Cambridge, Mass.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16] Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 748-758. 17 refs. NSF-supported research.

A theoretical treatment of lasers in terms of correlation functions of the second-quantized electromagnetic and matter fields is described. Equations for these functions are derived using a generating functional due to Schwinger. The density operator for the system is implicitly defined by identifying certain quantities in these equations with phenomenological cavity and pump characteristics. The assumption that the laser field above threshold is a coherent oscillation leads, in a certain approximation, to the semiclassical theory of Lamb. Because of the presence of incoherent emission, however, this is unacceptable as it predicts an infinite incoherent energy density. Nevertheless a plausible argument allows an evaluation of the laser linewidth, yielding half the Townes value. The theory is then restated in a form where no true oscillation occurs. The previous values of frequency, intensity, and linewidth reappear when a four-field correlation function is approximated by an expression showing approximate coherence in the sense of Glauber.

(Author)

**A66-26216****MODELS OF INTERACTING RADIATION AND MATTER FOR GAS LASERS.**

Charles R. Willis (Boston University, Boston, Mass.).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16] Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 769-780. 7 refs. USAF-sponsored research.

We investigate a model of  $N$  two-level atoms interacting with radiation in the presence of dissipation and pumping. First we show that the self-consistent field approximation is a solution of our equations to lowest order in the dimensionless coupling constant  $\alpha$ . The definition of  $\alpha$  is  $(N r_0 \lambda^2)^{1/2}$  where  $N$  is the number of two-level atoms per unit volume,  $r_0$  is the classical electron radius, and  $\lambda$  is the wavelength of the radiation. When we consider the center-of-mass motion we get a second dimensionless constant  $\beta = \alpha(\omega_0/\omega_D)$  where  $\omega_0$  is the atomic frequency and  $\omega_D$  is the Doppler width. When  $\beta$  is small the electromagnetic field amplitude varies slowly on the time scale of the center-of-mass motion. We find a unique stable stationary state and show that it is approached rapidly, independent of initial conditions. We find solutions of our equations corresponding to zero average field with the same steady-state energy density and cavity frequency shift as in the self-consistent field approximation. When pump-induced correlations are present, we also show, using perturbation theory, that the solution of our equations corresponding to zero average field has the same steady-state energy density and cavity frequency shift as the average-field theories of Lamb and of Haken and Sauermann.

(Author)

**A66-26217****DYNAMICS OF TWO-MODE OPERATING LASERS.**

N. G. Basov, V. N. Morozov, and A. N. Oraevsky (Academy of Sciences, Institute of Physics, Moscow, USSR).

IN: PHYSICS OF QUANTUM ELECTRONICS; PROCEEDINGS OF THE PHYSICS OF QUANTUM ELECTRONICS CONFERENCE, SAN JUAN, PUERTO RICO, JUNE 28-30, 1965. [A66-26141 13-16] Conference sponsored by the Office of Naval Research, Department of the Navy.

Edited by P. L. Kelley, P. E. Tannenwald, and B. Lax. New York, McGraw-Hill Book Co., 1966, p. 781-787. 10 refs.

Investigation of periodic, undamped oscillations in the power intensity of an optical maser with two modes. This is an attempt to find an explanation for the oscillations by studying the simplest multimode laser. Separate consideration is given to the cases (1) where the spacing between natural frequencies is considerably greater than the width of each resonance curve and (2) where the resonance curves are essentially overlapping.

R.A.F.

**A66-26239****GAS-LASER DETERMINATION OF THE ELECTRON DENSITY IN THE AFTERGLOW OF A HYDROGEN DISCHARGE.**

J. M. P. Quinn (United Kingdom Atomic Energy Authority, Atomic Energy Research Establishment, Culham Laboratory, Culham, Berks., England).

Journal of Nuclear Energy, Part C - Plasma Physics, Accelerators, Thermonuclear Research, vol. 7, Mar. -Apr. 1965, p. 113-122. 13 refs.

A helium-neon gas laser has been used to determine the electron density variation, both spatial and temporal, in the afterglow of a Z-pinch in hydrogen at 100 mtorr. The percentage ionization, defined as the ratio of the electron density to the initial gas density, was found to drop from approximately 100% to 1% in two phases. During the first phase, lasting 10  $\mu$ sec, the dominating process was recombination. In the second phase, lasting a further 90  $\mu$ sec, ambipolar diffusion took over completely. Further, the results obtained for the density variation on the axis are compared with similar determinations using completely independent techniques.

(Author)

**A66-26307 #****ON THE USE OF LASER LIGHT SOURCES IN SCHLIEREN-INTERFEROMETER SYSTEMS.**

A. K. Oppenheim, P. A. Urtiew, and F. J. Weinberg (California, University, Berkeley, Calif.).

Royal Society (London), Proceedings, Series A, vol. 291, Apr. 5, 1966, p. 279-290. 21 refs.

Grant No. AF AFOSR 129-65.

Consideration of the recording of refractive index fields, in which the exceedingly high monochromatic brightness of laser light sources opens up new possibilities where applications to very fast or highly self-luminous phenomena are concerned. The properties of laser light, however, pose special problems, as well as presenting special opportunities. These are examined in relation to schlieren recording, deflection mapping, shadowgraphy and interferometry. The ultimate aim is the development of a versatile optical system which is capable of fulfilling all these functions with only minor readjustments in its optical components. This is achieved, for laser light, without either the expensive apparatus, or the considerable intensity losses with which such systems are otherwise associated.

M.M.

**A66-26334****ON THE MEASUREMENT OF THE COMPLEX SPATIAL COHERENCE OF A He-Ne LASER BEAM.**

J. V. Cornacchio and K. A. Farnham (International Business Machines Corp., Systems Development Div., Endicott, N. Y.).

Nuovo Cimento, vol. 42 B, Mar. 11, 1966, p. 108-120. 9 refs.

The feasibility of determining by experiment the magnitude and phase of the complex spatial coherence of a laser beam using the recently derived inversion expression for complex spatial coherence is demonstrated. Both magnitude and phase dependence for two laser excitation levels for a wide range of correlation intervals is presented. The ratio of the degree of coherence at the two levels for a continuous range of correlation interval is evaluated yielding results consistent

with other known experimental facts. The degree of coherence was found to be lower at the higher level of laser excitation. The use of the inversion expression for the experimental determination of the complex spatial coherence for narrow linewidth beams is pointed out. The difficulty in presently establishing the spatial stationarity of the beam, and its relation to the applicability of the inversion expression are discussed. (Author)

#### A66-26336

##### SELECTION OF THE 6401 Å LINE IN A He-Ne LASER WITH HEMI-SPHERICAL GEOMETRY.

P. Burlamacchi (Consiglio Nazionale delle Ricerche, Centro Microonde, Florence, Italy) and G. Toraldo di Francia (Firenze, Università, Istituto di Fisica Superiore, Florence, Italy). Nuovo Cimento, vol. 42B, Mar. 11, 1966, p. 186-188.

Observation of laser emission on the 6401 Å line, corresponding to the  $Ne(3s_2-2p_2)$  transition. The He-Ne laser normally operates at 6328 Å. The results obtained are shown in a figure where the intensities of both emissions measured separately are plotted vs plane-mirror shift. Presumably the main reason for the selection obtained is the geometrical instability of the optical cavity which appears when the mirror spacing is increased beyond the value of the radius of curvature. M. M.

#### A66-26345

##### RAMAN DIFFUSION SPECTRA EXCITED BY A LASER SOURCE [SPECTRES DE DIFFUSION RAMAN EXCITES PAR UNE SOURCE LASER].

Michel Krauzman (Paris, Université, Laboratoire des Recherches Physiques, Paris, France). Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques, vol. 262, no. 11, Mar. 14, 1966, p. 765-767. In French.

Description of the experimental arrangement required for the observation of Raman spectra using an He-Ne gas laser with a 50 mw output at 6328 Å. A new method for filtering out the exciting radiation is described. No spectra could be obtained when the coefficient of extinction exceeded  $8\text{ cm}^{-1}$  for conventional observations; in every case the results depended on the purity of the sample. The diffusion effect is very intense when there is no change of wavelength caused by impurities; such changes tend to mask the Raman lines - particularly for low frequencies. Some results are given for  $[Cr(CN)_6]K_3$ ,  $[Fe(CN)_6]K_4$ , and other crystals. D. P. F.

#### A66-26375 #

##### LASER PHOTOMETRY [PHOTOMETRIE DU LASER].

Michel Philbert. (Symposium sur la Physique du Laser et ses Applications, Berne, Switzerland, Oct. 12-14, 1964, Paper.) La Recherche Aérospatiale, no. 110, Jan.-Feb. 1966, p. 49-58. 12 refs. In French.

Description of a general method for the absolute measurement of fluxes in the case of pulsed and triggered lasers based only on the use of quantum receivers. The following two aspects of the problem are examined: (1) the calibration of the receivers from thermal radiation laws, and (2) the relative aspect of laser beam attenuation. A measuring device using a mixed attenuation mode by diffusion and variable absorption is described. M. M.

#### A66-26382

##### CHEMICAL LASERS.

George C. Pimentel (California, University, Berkeley, Calif.). Scientific American, vol. 214, Apr. 1966, p. 32-39.

Discussion of the theory and operation of two self-pumping chemical lasers. The theory of laser operation in general is briefly reviewed, and three basic laser components are identified: a suitable set of energy levels, a pumping system, and an optical cavity. It is pointed out that chemical pumping - derived from the release of energy associated with the making and breaking of chemical bonds - is unique in that the energy-level system intrinsically supplies the pumping energy. Two chemical lasers are discussed: one based on bond breaking of organic, iodine-containing compounds and the other involving the violent reaction between

hydrogen and chlorine. Two major advantages of chemical lasers - the very high gain of energy in the system and their use as tools to reveal the detailed distribution of energy among the various product species in elementary reactions - are cited. M. L.

#### A66-26471 #

##### SEPARATION OF THE MONOCHROMATIC RADIATION OF A RUBY LASER WITH THE AID OF TAPERED MULTIPLEX INTERFEROMETER WITH "OPPOSITE DISPERSION" [VYDELENIE MONOKHROMATICHESKIKH IZLUCHENII OKG NA RUBINE S POMOSHCH'IU KLINOBRAZNOGO MUL'TIPLEKS-INTERFEROMETRA SO "VSTRECHNOI DISPERSIET"].

F. A. Korolev and S. M. Mamedzade (Moskovskii Gosudarstvennyi Universitet, Kafedra Optiki, Moscow, USSR). Moskovskii Universitet, Vestnik, Seriya III - Fizika, Astronomiya, vol. 21, Jan.-Feb. 1966, p. 105-109. 6 refs. In Russian.

Application of a device consisting of series-connected Fabry-Pérot interferometers operating in the tapered mode to the separation of the individual components of the radiation spectrum of a ruby laser. The components are separated both from a continuous and a line spectrum. A continuous spectrum is obtained when the reflecting surfaces are the end faces of the crystal coated with a silvery dielectric material, and a line spectrum when the mirrors consist of a number of glass cylinders and are located at some distance from the end faces of the crystal. V. P.

#### A66-26548

##### LASER RADAR (LIDAR) FOR METEOROLOGICAL OBSERVATIONS.

C. A. Northend, R. C. Honey, and W. E. Evans (Stanford Research Institute, Menlo Park, Calif.). Review of Scientific Instruments, vol. 37, Apr. 1966, p. 393-400. 26 refs.

Contract No. Nonr-4471(00).

This paper describes an experimental high powered, Q switched, ruby laser radar or lidar designed for meteorological applications and upper atmosphere studies being conducted by the Environmental Sciences Division, Range Development Department, Pacific Missile Range, Point Mugu, Calif. The lidar system equations, detailed design, operation, and recommendations for design improvements are discussed, and typical observational data are presented to illustrate the uses of this new meteorological instrument. (Author)

#### A66-26559

##### COOLER FOR SEMICONDUCTOR LIGHT EMITTERS, LASERS, AND PHOTODETECTORS.

H. K. Kessler (National Bureau of Standards, Institute for Applied Technology, Electronic Instrumentation Div., Washington, D. C.). Review of Scientific Instruments, vol. 37, Apr. 1966, p. 517, 518.

Description of a cooler for semiconductor light emitters, lasers, and photodetectors which overcomes the limitations of conventional coolers by using low-temperature gas rather than liquid as the cooling medium. The system is simple and obviates the necessity of using optical windows which frequently increase the difficulty and cost of fabricating conventional Dewar systems. The cooler consists of an ordinary 500 cm<sup>3</sup> vacuum flask, with a 5-ohm heating resistor, liquid nitrogen level indicator, and heat exchange coil. The power supplied to the resistor can be varied from 5 to 20 watts, and serves to control the rate of evaporation of the liquid nitrogen. Cooling of a GaAs laser by this technique has shown that a major part of the light fluctuation from a GaAs laser immersed in cryogenic liquids, commonly attributed to bubbling in the liquid, is in fact due to mode switching or similar phenomena in the laser itself. M. M.

#### A66-26564

##### ALIGNMENT OF FASTIE-EBERT SPECTROMETERS USING He-Ne LASER.

R. C. Ohlmann and A. Mego (Westinghouse Electric Corp., Research Laboratories, Pittsburgh, Pa.). Review of Scientific Instruments, vol. 37, Apr. 1966, p. 530, 531.

Description of a procedure for the adjustment of angular positions of the spherical mirror and grating of a Fastie-Ebert spectrometer using the bright, collimated, monochromatic beam of a small (low cost) He-Ne 6328 Å laser. Although the principles of the technique are applicable to various types of spectrometers, they have actually been applied on 1/2-m focal length Jarrell-Ash model 82-000 monochromators. M. M.

**A66-26571**

ON THE OPTIMUM GEOMETRY OF A 6328 Å LASER OSCILLATOR. P. W. Smith (Bell Telephone Laboratories, Inc., Crawford Hill Laboratory, Holmdel, N.J.).

IEEE Journal of Quantum Electronics, vol. QE-2, Apr. 1966, p. 77-79. 8 refs.

Development of approximate calculations of the maximum output power of a 6328 Å He-Ne gas laser for a number of laser tubes and comparison of the results with experimentally observed values. Good agreement is obtained; similar calculations are then used to determine the maximum output power, optimum mirror transmission, and optimum length and diameter of the laser tube for a number of special cases. Two cases of single-mode operation are considered, including the use of single mirror end reflectors and of frequency selective end reflectors; power output in one mode of multimode output and output in all modes are also discussed. B. B.

**A66-26572**

OPTIMIZATION OF THE GALLIUM ARSENIDE INJECTION LASER FOR MAXIMUM CW POWER OUTPUT.

J. Vilms, L. Wandinger, and K. L. Kohn (U.S. Army, Electronics Command, Electronic Components Laboratory, Fort Monmouth, N.J.).

IEEE Journal of Quantum Electronics, vol. QE-2, Apr. 1966, p. 80-83. 11 refs.

Use of a basic mathematical model of the injection laser to investigate several questions regarding the maximum obtainable power output and factors which impose practical limitations on it. Using the rate equations for electron and photon densities and a simple model of thermal resistance, it is shown that there exists an optimum value of diode area WL and of the parameter  $S = \alpha L / \hbar(1/R)$ , which suggests that the CW power output cannot be increased indefinitely with larger diodes. Numerical calculations for the case of band-to-band transitions between parabolic bands give  $10^{-4}$  cm<sup>2</sup> and 0.1 for the optimum values of WL and S, respectively, for operation at 77°K, and indicate a maximum power output of 5 watts with 56% total efficiency. The output is found to decrease slowly with increasing bulk loss coefficient  $\alpha$  and increasing active region width. B. B.

**A66-26591**

MOVING STRIATIONS AND CATAPHORETIC EFFECTS IN A He-Ne LASER.

A. Garscadden (USAF, Office of Aerospace Research, Aerospace Research Laboratories, Wright-Patterson AFB, Ohio).

Applied Physics Letters, vol. 8, Feb. 15, 1966, p. 85-87. 9 refs.

Some measurements of the consequences of cataphoresis in a He-Ne laser, including its influence on the moving striations and associated "noise" occurring in the discharge. Both the cataphoresis and the moving striations are shown to affect the laser output. The symmetrical discharge tube (previously described) was filled with a 4:1 He-Ne mixture at 1.5 torr, and the laser interaction length was about 50 cm with an internal tube diameter of 4 cm. A plot of the intensity changes of spectral lines in the sidelight emission from the turn-on value  $I_0$  to the equilibrium value  $I_\infty$  as a function of position along the laser interaction region is presented. M. L.

**A66-26593**

LOCKING OF LASER OSCILLATORS BY LIGHT INJECTION.

H. L. Stover and W. H. Steier (Bell Telephone Laboratories, Inc., Crawford Hill Laboratory, Holmdel, N.J.).

Applied Physics Letters, vol. 8, Feb. 15, 1966, p. 91-93.

Account of the successful phase locking of one laser to another by direct injection of the first laser beam into the cavity of the second laser. This method of phase locking is different from that

of Enloe and Rodda, who used a phase-locked loop with a low-frequency feedback circuit to control the frequency of the second laser. The locking range of the laser is measured as a function of drive level of the locking signal, and it is found that the experimental results compare favorably with the classic theory of locking phenomena in oscillators. The system consisted of two He-Ne gas lasers, an isolator, and a series of mirrors and beam splitters. M. L.

**A66-26594**

PROPULSION AND ANGULAR STABILIZATION OF DUST PARTICLES IN A LASER CAVITY.

Eric G. Rawson and A. D. May (Toronto, University, Toronto, Canada).

Applied Physics Letters, vol. 8, Feb. 15, 1966, p. 93-95.

Research supported by the National Research Council of Canada.

Account of the observation in a He-Ne laser cavity of dust particles which travel at constant velocities in one of three preferred directions and which exhibit remarkable stability of orientation. The three preferred directions are parallel to the laser beam, transverse to the beam, and at  $36^\circ \pm 10^\circ$  to the beam. Particle velocities range from 0.2 cm/sec to about 10 cm/sec; many particles reverse direction frequently and at random times, while others are extremely stable. Time exposures showing tracks of moving dust particles are included. It is believed that asymmetric dust particles are being propelled, either by light pressure or photophoresis, at a constant velocity such that the driving force is balanced by the viscous drag of the air. This is thought to be the first observation of angular stabilization of matter by radiation. M. L.

**A66-26598**

DEUTERIUM ISOTOPE EFFECT ON THE PERFORMANCE OF EUROPIUM CHELATE LASERS.

Daniel L. Ross, Joseph Blanc, and Robert J. Pressley (Radio Corporation of America, RCA Laboratories, Princeton, N.J.).

Applied Physics Letters, vol. 8, Feb. 15, 1966, p. 101, 102. 5 refs.

Demonstration of the critical dependence of laser thresholds on apparently trivial chemical changes in octacordinate europium chelate lasers. A chelate previously reported to show laser action, piperidinium tetrakis (4,4,4-trifluoro-1-phenyl-1,3-butanedione) Eu(III), [(TFPBD)<sub>4</sub> Eu pip] was prepared using a diketone in which the benzene-ring hydrogen atoms were replaced by deuterium. The results demonstrate that solvent thermal effects may not be a major limitation on the performance of chelate solution lasers; on the other hand, it is clear that spectroscopic properties derived from measurements at low excitation levels (emission and absorption spectra, quantum yields and luminescence decay times) are far from sufficient to either describe or predict the laser performance of europium chelates. M. L.

**A66-26683**

LASER-GENERATED IMPLOSIONS.

J. W. Daiber, A. Hertzberg, and C. E. Wittliff (Cornell Aeronautical Laboratory, Inc., Buffalo, N.Y.).

Physics of Fluids, vol. 9, Mar. 1966, p. 617-619. 13 refs.

Contract No. AF 33(657)-8860.

By using a weak spherical blast wave to shape the initial density distribution, the laser energy can be preferentially coupled to the periphery of this sphere. This energy addition to the shell of high density gas then produces an imploding plasma. (Author)

**A66-26819**

PRODUCTION OF DENSE PLASMOIDS BY FOCUSING A LASER BEAM ON A TARGET [PRODUCTION DE BOUFFEES DE PLASMA DENSE PAR FOCALISATION D'UN FAISCEAU LASER SUR UNE CIBLE].

T. Consoli, G. Gormezano, and L. Slama (Commissariat à l'Energie Atomique, Centre d'Etudes Nucléaires de Saclay, Services de Physique Appliquée, Gif-sur-Yvette, Seine-et-Oise, France).

Bulletin d'Informations Scientifiques et Techniques, Mar. 1966, p. 61-68. In French.

Description of a technique for the production of neutral or ionized-gas plasmoids by focusing a beam of coherent light emitted

by a ruby laser on a target or pure metal or metal with an absorbed gas. The mechanism of the production of plasmoids by laser-beam impact is discussed and their characteristics are examined. Methods for measuring the electron density and ion temperature of the resultant plasmas are considered. A practical plasma generator is described using a lithium deuteride target subjected to laser-beam action. A technique is presented for accelerating the ions and electrons in plasmoids formed by laser action. The technique can be used as an ion gun. Ion currents of more than 1000 amp were obtainable for periods lasting as long as some 10  $\mu$ sec. D.P.F.

#### A66-26822

EXPOSITION OF IMPROVEMENTS FOR THE PRESENT STATE OF PLASMA DIAGNOSTIC METHODS USEFUL FOR APPLIED PHYSICS. III - STUDY OF DENSE PLASMAS WITH THE HELP OF LASERS [EXPOSE DE MISE AU POINT SUR L'ETAT ACTUEL DES METHODES DE DIAGNOSTIC DU PLASMA AUX SERVICES DE PHYSIQUE APPLIQUEE. III - DIAGNOSTIC DES PLASMAS DENSES A L'AIDE DE LASERS].

T. Consoli, C. Gormezano, and L. Slama (Commissariat à l'Energie Atomique, Centre d'Etudes Nucléaires de Saclay, Services de Physique Appliquée, Gif-sur-Yvette, Seine-et-Oise, France).

Bulletin d'Informations Scientifiques et Techniques, Mar. 1966, p. 81-87. In French.

Discussion of the application of laser-beam techniques to the case of plasmas with electron densities in excess of  $10^9$  to  $10^{14}$  electrons/cm<sup>3</sup>. The theory of the incoherent diffusion of a ruby laser beam in a plasma is reviewed. The experimental techniques for measuring the temperature and electron density by measuring the diffusion of laser light in a plasma produced by the discharge of a 2.5  $\mu$ f capacitor in a monospiral of wire 3 cm in diameter and 3 cm in length are described. The experimental results are analyzed and it is found that they are in agreement with those obtained by measurement of the Stark effect and by laser interferometric methods. D.P.F.

#### A66-26859 #

COMPARISON OF TIME-DELAY SPREAD AND SPATIAL COHERENCE FOR IONOSPHERIC PROPAGATION.

Karl D. Felperin (Stanford Research Institute, Communication Laboratory, Menlo Park, Calif.).

Radio Science, vol. 1, Mar. 1966, p. 285-293. 13 refs. Contract No. DA-36-039-SC-90859.

This paper describes spatial selective fading (interference patterns due to modal arrival angle differences) as a homogeneous random process. It is shown that for ionospheric propagation, the power spectrum in vector wave number (wave number dispersion profile) should be of approximately the same shape as the power spectrum in time delay (time-delay profile). On the basis of this similarity, it is suggested that the correlation between signals from spaced antennas (spatial coherence) should be inversely proportional to rms time-delay spread. An experiment was performed on a 4100-km path at 7 and 14 Mc to verify this assumption. Results are generally in agreement with theory, and discrepancies that do exist are analyzed. (Author)

#### A66-26867

FILLING IN THE BLANKS IN THE LASER'S SPECTRUM.

Fred M. Johnson (Electro-Optical Systems, Inc., Pasadena, Calif.). Electronics, vol. 39, Apr. 18, 1966, p. 82-87. 15 refs.

Study of the interposition of a dielectric material in a laser beam in which an intense optical beam produces nonlinear effects, in an attempt to obtain powerful beams at several frequencies from the same laser. A combination of Raman and other nonlinear phenomena are observed with an experimental facility which includes a Q-switched neodymium laser and two KDP crystals. The representation by Maxwell's equations of the interaction of a laser beam with a nonlinear medium is considered, and parametric amplification of light at various frequencies and double vibration are discussed.

B. B.

#### A66-26881

INFRARED AND VISIBLE LASER MODULATION USING FARADAY ROTATION IN YIG.

R. N. Zitter and E. G. Spencer (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

(Annual Conference on Magnetism and Magnetic Materials, 11th, San Francisco, Calif., Nov. 16-19, 1965, Paper.) Journal of Applied Physics, vol. 37, Mar. 1, 1966, p. 1089, 1090. 13 refs.

Faraday rotation in YIG has been employed to modulate 3.39- $\mu$  radiation in a helium-neon laser. YIG has sufficient transparency at this wavelength to permit placement within the optical cavity. Modulation at 13 Mc corresponds to the round-trip time  $2L/c$  of photons in the cavity, and with the lasing condition, mode locking is observed with a spiked output beam similar to effects previously reported for lasers at 6328 Å. By the use of prisms and separate mirrors, lasing can occur simultaneously at 3.39  $\mu$  and 6328 Å, where modulation effects in the 3.39- $\mu$  beam are transferred to the visible 6328-Å beam. A variety of effects in the visible beam are observed, depending on the state (lasing or superradiant) of the 3.39- $\mu$  beam; in particular, "spiking" or its opposite may be induced in the visible beam. (Author)

#### A66-26918

OPTICAL COMMUNICATION.

James P. Gordon (Bell Telephone Laboratories, Inc., Quantum Electronics Research Dept., Murray Hill, N.J.).

International Science and Technology, Aug. 1965, p. 60-64, 66, 69.

Consideration of a variety of electrooptical techniques to permit communicating over a laser beam. Lasers possess high directionality and monochromaticity, which is advantageous for secure communications and radar-type applications. By arrangement of suitable lenses, reliable transmission through a pipe may be possible over several hundred miles. In free space, a laser beam would be about 1/2 mi wide at a distance of 300,000 mi. For the case of earthbound transmission, lasers suffer attenuation in rain, snow, and, especially, fog.

F. R. L.

#### A66-26961

INTRODUCTION TO LASER PHYSICS.

B. A. Lengyel (San Fernando Valley State College, Northridge, Calif.).

New York, John Wiley and Sons, Inc., 1966. 311 p. \$8.95.

This is an introductory book ideally suited to a reader with moderate general knowledge of atomic physics and electronics, who aims for an understanding of lasers of all types. The book opens with a chapter containing general background material on radiation and atomic physics. A brief general description of lasers of various types is given and analytical considerations pertaining to threshold condition, modes of oscillation, and laser linewidth are presented. Solid, liquid, and gas lasers are described in detail. A chapter on mode structure, pulsations, and giant pulse, and another chapter on nonlinear phenomena round out the discussion of laser physics. A preview of laser applications is presented.

M. F.

#### A66-26964

NON-LINEAR OPTICS.

P. S. Pershan (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

IN: PROGRESS IN OPTICS. VOLUME 5.

Edited by Emil Wolf.

Amsterdam, North-Holland Publishing Co.; New York, John Wiley and Sons, Inc., 1966, p. 83-144. 107 refs.

Navy-Army-USAF-ARPA-supported research.

Review of the theoretical and experimental developments of the last three years in the field of nonlinear optics of laser development. Comments are made on Maxwell's equations, and some of the fundamental concepts are established. The nonlinear response of the material systems is discussed together with the wave solutions when nonlinearities are included in Maxwell's equations. The experimental results are reviewed and related to the previous theoretical considerations. M. M.

**A66-26965****TWO-BEAM INTERFEROMETRY.**

W. H. Steel (Commonwealth Scientific and Industrial Research Organization, Div. of Physics, National Standards Laboratory, Sydney, Australia).

IN: PROGRESS IN OPTICS. VOLUME 5.

Edited by Emil Wolf.

Amsterdam, North-Holland Publishing Co.; New York, John Wiley and Sons, Inc., 1966, p. 145-197. 114 refs.

Review of progress in two-beam interferometry using as background modern coherence theory. Applications of coherence theory only are given. M. M.

**A66-27026****SINGLE-MODE OPERATION OF A ROOM-TEMPERATURE CW RUBY LASER.**

Dieter Roess (Siemens und Halske AG, Zentrallaboratorium, Munich, West Germany).

Applied Physics Letters, vol. 8, Mar. 1, 1966, p. 109-111. 10 refs.

Observation of regular and damped relaxation oscillations in the single-mode operation of a room-temperature CW ruby laser in qualitative accordance with the rate equations. The observations fully agree with former experiments on one-mode pulsed ruby lasers and with the solutions of rate equations. When one mode is isolated at a time, the emission is in form of strictly regular relaxation oscillations which for proper resonator conditions are periodical and damped and lead into continuous emission. With several modes oscillating at a time, mode locking and nonlinear interactions destroy the simple picture and lead to a more or less random emission.

M. F.

**A66-27028****ROOM TEMPERATURE SUPER-RADIANCE RADIATION IN N-TYPE GaAs BY CONTINUOUS ELECTRON-BEAM EXCITATION.**

H. C. Casey, Jr. and R. H. Kaiser (Bell Telephone Laboratories, Inc., Murray Hill, N. J.).

Applied Physics Letters, vol. 8, Mar. 1, 1966, p. 113-115. 17 refs.

Description of the observation of superradiance radiation in heavily doped bulk n-type GaAs at room temperature when excited by the continuous electron beam of the microprobe. For a given donor concentration, the results suggest that compensation permits satisfying the necessary conditions for stimulated emission at a lower excitation level. The quadratic emission observed is interpreted as being superradiance (stimulated emission which is relatively incoherent).

M. F.

**A66-27029****THE EFFECT OF ABSORBER RELAXATION ON PASSIVE Q-SWITCH LASER PERFORMANCE.**

R. McLeary and P. W. Bowe (Department of Supply, Australian Defence Scientific Service, Defence Standards Laboratories, Maribyrnong, Victoria, Australia).

Applied Physics Letters, vol. 8, Mar. 1, 1966, p. 116, 117.

Extension of the Szabo and Stein's (1965) theory of the giant pulse laser using a saturable absorber, to include absorber relaxation. Rate equations which describe the formation of the pulse are given. The cross section  $\sigma$  for chloro-aluminum phthalocyanine was measured to be  $3 \times 10^{-16}$  cm<sup>2</sup>.

M. F.

**A66-27030****DETERMINATION OF VIBRATION-ROTATIONAL LINE STRENGTHS AND WIDTHS IN CO<sub>2</sub> USING A CO<sub>2</sub>-N<sub>2</sub> LASER.**

T. K. McCubbin, Jr., Ronald Darone, and James Sorrell (Pennsylvania State University, Dept. of Physics, University Park, Pa.).

Applied Physics Letters, vol. 8, Mar. 1, 1966, p. 118, 119. 12 refs. USAF-supported research.

Measurement of vibrational band strengths, rotational line strengths, and line widths in CO<sub>2</sub> using a CO<sub>2</sub>-N<sub>2</sub> laser. The strength of the 10.4- $\mu$  CO<sub>2</sub> band was determined by observing the curves of growth for several rotational lines and by a new method

using a laser. The measurements were made using a 2.5-m echelle-prism spectrometer with a thermocouple detector and a White multiple reflection cell that could provide paths up to 18.10 m in multiples of approximately 2.67 m. Determinations of the strength of the P(20) line in the 10.4- $\mu$  band from curves of growth for a P branch line in the 9.6- $\mu$  band gave values of  $0.000489 \pm 0.000040$  and  $0.000467 \pm 0.000040$  cm<sup>-2</sup> atm<sup>-1</sup>, respectively. Band intensities of 10.4- $\mu$  CO<sub>2</sub> at 300°K are tabulated.

M. F.

**A66-27031****ELECTRON-BEAM PUMPED LASERS OF CdSe AND CdS.**

C. E. Hurwitz (Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.).

Applied Physics Letters, vol. 8, Mar. 1, 1966, p. 121-124. 12 refs. USAF-supported research.

Report of the observation of laser oscillations in CdSe and CdS bombarded by a beam of fast electrons. In CdSe a peak output power in the red (6800-6900 Å) in excess of 10 watts with a power efficiency of better than 5% at both liquid helium and liquid nitrogen temperatures has been measured. This is the first report of a high-efficiency, visible laser action obtained with this technique. Laser oscillations with well-defined cavity modes and spatial diffraction patterns in electron-beam pumped CdS at 4.2°K and also at 77°K have been obtained. In addition a peak output power of 10 watts at 4910 Å with an efficiency of 0.7% at 4.2°K was measured. The emission spectra from electron-beam pumped CdSe and CdS laser near liquid-nitrogen temperature are graphed.

M. F.

**A66-27035****LASER WAVE PROPAGATION THROUGH THE ATMOSPHERE.**

H. Hodara (National Engineering Science Co., Pasadena, Calif.). (AGARD, Ionospheric Research Committee, Symposium, 10th, Rome, Italy, Sept. 21-25, 1965, Paper.)

IEEE Proceedings, vol. 54, Mar. 1966, p. 368-375. 12 refs.

Analysis of atmospheric turbulences and their effects on communication systems based on direct optical display transmission using laser beams. The existence of system limitations other than those imposed by attenuation and scattering normally associated with incoherent waves is noted. It is shown that this is so because the laser directivity and coherence responsible for increased channel capacity are easily destroyed or at least degraded by random thermal turbulences. Simple expressions describing the effects of atmospheric turbulence on laser beam propagation are obtained. Corresponding calculations yield the order of magnitude of such random phenomena as beam scanning, phase variation, beam cross-section change, and amplitude and frequency modulation. In particular, the polarization fluctuation is predicted quantitatively in terms of the atmosphere mean square refractive index and its turbulence correlation length.

M. L.

**A66-27053****LASER DOPPLER VELOCIMETER FOR MEASUREMENT OF LOCALIZED FLOW VELOCITIES IN LIQUIDS.**

J. W. Foreman, Jr., R. D. Lewis, J. R. Thornton, and H. J. Watson (Brown Engineering Co., Research Laboratories, Huntsville, Ala.).

IEEE Proceedings, vol. 54, Mar. 1966, p. 424, 425.

Contract No. NAS 8-20073.

Experimental study of a laser Doppler velocimeter that measures localized flow velocities in fluids by sensing the Doppler shift in monochromatic laser light scattered from small contaminant particles in the fluid. Measurements of localized flow velocities in ordinary tap water are reported using the basic optical system of Foreman, George, and Lewis. The arrangement of the optical system of the device is illustrated. The flow velocities measured by volumetric and laser Doppler methods are compared. It is concluded that the results agree within the estimated limits of experimental error.

M. L.

**A66-27054****THE TWO-WAY TRANSMISSION OF A RUBY-LASER BEAM BETWEEN EARTH AND A RETROREFLECTING SATELLITE.**

P. H. Anderson, C. G. Lehr, L. A. Maestre (Smithsonian Institution, Smithsonian Astrophysical Observatory, Cambridge, Mass.), H. W. Halsey, and G. L. Snyder (General Electric Co., Missile and Space Div., King of Prussia, Pa.).

IEEE, Proceedings, vol. 54, Mar. 1966, p. 426, 427.  
Grant No. NaG-87-60.

Experimental study reporting the photographic and photoelectric observation of the return of ruby laser energy that had been transmitted from the ground and subsequently reflected from the corner-cube assembly of the Explorer 22 satellite. Experiments were performed at the Smithsonian Astrophysical Observatory, Organ Pass, N.M. A photograph is presented that shows the point image of the satellite when it was at an elevation of  $60^\circ$  and a slant range of 1100 km. The greatest range obtained was 2100 km at an elevation of  $27^\circ$ . The oscillographic displays of the transmitted and returned pulses are compared, and several possible reasons are suggested for their differences. M. L.

#### A66-27055

##### CURRENT CHANGES DUE TO LASING ACTION.

A. Garscadden and S. L. Adams (USAF, Office of Aerospace Research, Aerospace Research Laboratories, Wright-Patterson AFB, Ohio).

IEEE, Proceedings, vol. 54, Mar. 1966, p. 427, 428. 5 refs.

Experimental study in which a more complete description is given of the influence of laser action on the current through the gas discharge producing the action. Current change  $\Delta i$  and laser power (at  $6328 \text{ \AA}$ ) are plotted as functions of discharge current. Current change is also plotted as a function of lasing power. The results are compared with the data of White and Gordon; it is concluded that it appears most probable that the measured  $\Delta i$  represents mainly the difference in the cumulative ionization from the neon  $3s_2$  level and that from the  $2p$  levels and the  $1s$  metastable levels. M. L.

#### A66-27065 #

##### STEADY-STATE REGIME OF OSCILLATION IN A LASER [STATIONARNYI REZHIM KOLEBANII V KVANTOVOM GENERATORE].

A. I. Alekseev and Iu. A. Tarasov (Moskovskii Inzhenerno-Fizicheskii Institut, Moscow, USSR).

Fizika Tverdogo Tela, vol. 8, Mar. 1966, p. 696-704. 20 refs.

In Russian.

Theoretical study of the electromagnetic oscillations of a laser near the steady-state regime, based on equations for vector potential, polarization current, and population-transfer levels. It is determined that, in the absence of isolated modes in the steady-state regime, only the central mode remains, while the others disappear. R. A. F.

#### A66-27131 #

##### DETERIORATION OF THE COHERENCE PROPERTIES OF A LASER BEAM BY ATMOSPHERIC TURBULENCE AND MOLECULAR SCATTERING.

A. Consortini, L. Ronchi, A. M. Scheggi, and G. Toraldo di Francia (Consiglio Nazionale delle Ricerche, Centro Microonde, Florence, Italy).

Radio Science, vol. 1, Apr. 1966, p. 523-530. 35 refs.

Turbulence and scattering can be considered as chiefly responsible for the deterioration of coherence properties of laser radiation when propagating through the atmosphere. The effect of atmospheric turbulence as well as the effect of molecular scattering (in a quiet atmosphere) on the space and time coherence, respectively, have been theoretically investigated within the limits of ray theory. As a result we found that there is a limiting diameter for the beam cross section beyond which the advantages of the space coherence are largely offset by the intervention of turbulence. On the other hand, the thermal movements of molecules may affect the time coherence (that is, the monochromaticity) of a highly monochromatic beam. (Author)

#### A66-27135 #

##### LIFETIME OF THE EXCITED STATE IN GASES [K VOPROSU O VREMENI ZHIZNI VOZBUZHDENNOGO SOSTOIANIIA V GAZAKH].

G. A. Begiashvili and O. N. Chavchanidze (Akademiia Nauk Gruzinskoi SSR, Institut Kibernetiki, Tiflis, Georgian SSR). Akademiia Nauk Gruzinskoi SSR, Soobshcheniia, vol. 41, Feb. 1966, p. 301-307. In Russian.

Estimation of the effective lifetime of the excited state of gas lasers, taking into account the role of near photon transfers. The effective lifetime when near photon transfers are taken into account is found to be 15 to 20% greater than the value obtained by Holstein, who did not take these transfers into account. It is also found that taking near photon transfers into account does not alter the nature of the dependence of the effective lifetime of the excited state, since this dependence is the same as that obtained by Holstein. It is shown that during Doppler line broadening in an unbounded medium there is a strict proportionality between the absorption coefficient and the line intensity of the photons emerging from an elementary radiating volume. A. B. K.

#### A66-27156 #

##### EFFECT OF A LONGITUDINAL MAGNETIC FIELD ON THE RADIATION POWER OF A HELIUM-NEON LASER AT $\lambda = 1.15 \mu$ [VLIANIE PRODOL'NOGO MAGNITNOGO POLIA NA MOSHCHNOST' IZLUCHE-NIIA GELII-NEONOVOGO LAZERA NA VOLNE $\lambda = 1.15 \text{ MK}$ ].

A. E. Fotiadi and S. A. Fridrikhov (Leningradskii Politehnicheskii Institut, Leningrad, USSR).

Zhurnal Tekhnicheskoi Fiziki, vol. 36, Mar. 1966, p. 560-563. 8 refs. In Russian.

Detailed study of the effect of a longitudinal magnetic field on the output power of a helium-neon laser operating in the infrared region of the spectrum ( $\lambda = 1.15 \mu$ ). The dependence of the radiation power of the laser on the magnetic field strength is ascertained for various gas-mixture pressures in the discharge tube and for various pumping levels. A. B. K.

#### A66-27183 #

##### VARIATION IN THE SHAPE OF A LIGHT PULSE DURING NONLINEAR AMPLIFICATION [IZMENENIE FORMY IMPUL'SA SVETA PRI NelineinOM USILENII].

N. G. Basov and V. S. Letokhov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

Akademiia Nauk SSSR, Doklady, vol. 167, Mar. 1, 1966, p. 73-76. 13 refs. In Russian.

Study of the variation in the shape of a light pulse of a laser with a modulated Q-factor during nonlinear amplification for the case where the length of the pulse is much greater than the transverse-relaxation time of the medium. The dependence of the pulse propagation velocity on the shape of the initial pulse is ascertained. The variation in the shape of the pulse during propagation is determined for a Gaussian pulse, an exponential pulse, and a pulse with a leading edge increasing according to a power law. A. B. K.

#### A66-27186 #

##### FLUCTUATIONS IN THE EMISSION OF A GAS LASER [O FLUKTUATSIYAKH IZLUCHEENIIA GAZOVOGO LAZERA].

Iu. I. Zaitsev (Gor'kovskii Gosudarstvennyi Universitet, Radiofizicheskii Institut, Gorki, USSR).

Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 50, Mar. 1966, p. 525-533. 16 refs. In Russian.

Study of low-frequency fluctuations in the emission of a gas laser. The modulation-depth coefficient, a quantity which characterizes the instability of the laser emission, is introduced. The dependence of the spectral density of this quantity on the frequency and power in a single-mode regime is discussed. The results of measurements of helium-neon lasers with a Fabry-Pérot resonator and a ring-type resonator are cited. A negative correlation of the intensity fluctuations of oppositely moving waves is found for the laser with the ring resonator. The modulation-depth coefficient due to optical oscillations of "combination frequencies" is determined. The experiments are performed at a wavelength of  $0.63 \mu$ . A. B. K.



**A66-27187 #**

A SEMICONDUCTOR QUANTUM GENERATOR WITH TWO-PHOTON OPTICAL EXCITATION [POLUPROVODNIKOVYI KVANTOVYI GENERATOR S DUKHFOTONNYM OPTICHESKIM VOZBUZHDENIEM].

N. G. Basov, A. Z. Grasiuk, I. G. Zubarev, V. A. Katulin, and O. N. Krokhin (Akademii Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, vol. 50, Mar. 1966, p. 551-559. 11 refs. In Russian.

Observation and study of generation in the semiconductor GaAs by two-photon absorption of the emission of a neodymium laser. The probability and coefficient of two-photon absorption are calculated. The dependence of the excitation intensity on the depth of excitation penetration into the semiconductor is determined, as well as the external coherent quantum yield and its dependence on internal losses in the active medium and on the length of the resonator. The calculated values of the coefficient of two-photon absorption, the penetration depth, and the external coherent quantum yield are found to be in good agreement with experiments.

A. B. K.

**A66-27320 #**

SOME APPLICATIONS OF THE GAS LASER AS A SOURCE OF LIGHT FOR THE TESTING OF OPTICAL SYSTEMS.

M. V. R. K. Murty and Daniel Malacara-Hernandez (Rochester, University, College of Engineering and Applied Science, Institute of Optics, Rochester, N. Y.).

IN: CONFERENCE ON PHOTOGRAPHIC AND SPECTROSCOPIC OPTICS, TOKYO, JAPAN, SEPTEMBER 1-5, 1964, AND KYOTO, JAPAN, SEPTEMBER 7, 8, 1964, PROCEEDINGS (Japanese Journal of Applied Physics, Supplement 1, vol. 4, 1965). [A66-27316 14-14] Conference sponsored by the International Commission for Optics, the Science Council of Japan, and the Japan Society of Applied Physics.

Tokyo, Japanese Journal of Applied Physics, 1965, p. 106-111; Discussion, Georges Nomarski (Paris, Université, Institut d'Optique, Paris, France), N. S. Kapany (Optics Technology, Inc., Belmont, Calif.), R. E. Hopkins (Rochester, University, College of Engineering and Applied Science, Institute of Optics, Rochester, N. Y.), A. I. Mahan (John Hopkins University, Applied Physics Laboratory, Silver Spring, Md.), and W. H. Steel, p. 111, 112. 6 refs. NASA-supported research.

Description of the use of a lateral shearing interferometer combined with a gas laser to form a simple, stable test facility for large optical systems. The interferometer consists of a single nearly parallel plate of glass, and the amount of shear is varied by changing the angle of incidence on the glass plate. A procedure is given for calculating the wavefront from the shearing pattern, and certain problems involved with the use of the gas laser are discussed. In the optical testing applications, it is necessary to control the spatial coherence of the laser independently, and a simple method to achieve this objective is described.

B. B.

**A66-27335 #**

SPECTROSCOPY OF He-Ne LASER DISCHARGE.

Norihiro Suzuki (Shimadzu Seisakusho, Ltd., Kyoto, Japan).

IN: CONFERENCE ON PHOTOGRAPHIC AND SPECTROSCOPIC OPTICS, TOKYO, JAPAN, SEPTEMBER 1-5, 1964, AND KYOTO, JAPAN, SEPTEMBER 7, 8, 1964, PROCEEDINGS (Japanese Journal of Applied Physics, Supplement 1, vol. 4, 1965). [A66-27316 14-14] Conference sponsored by the International Commission for Optics, the Science Council of Japan, and the Japan Society of Applied Physics.

Tokyo, Japanese Journal of Applied Physics, 1965, p. 642-646; Discussion, Chiyo Yamanaka (Osaka University, Osaka, Japan) and A. H. Kastler (Paris, University, Dept. of Physics, Paris, France), p. 647. 5 refs.

Investigation of the helium-neon laser afterglow period by measuring and analyzing metastable helium atoms and afterglow emission. In pulse operation of the He-Ne laser, oscillation at  $1.153 \mu$  was found to be enhanced in the afterglow period. Laser oscillation at  $6328 \text{ \AA}$  was not enhanced, apparently because of the short life of singlet metastable helium under long pulse excitation. However, when the duration of the exciting pulse is very short (less than  $10 \mu$

sec), the lifetime of singlet metastable helium is increased, because of the elimination of the  $600 \text{ \AA}$  band emission, and the  $6328 \text{ \AA}$  laser oscillates strongly in the afterglow period.

B. B.

**A66-27336 #**

STIMULATED EMISSION OF NEW INFRA-RED TRANSITIONS IN RARE GASES.

R. Cagnard, R. Der Agobian, J. L. Otto, R. Echard, and M. Pauthier (Laboratoire Central de Télécommunications, Paris, France).

IN: CONFERENCE ON PHOTOGRAPHIC AND SPECTROSCOPIC OPTICS, TOKYO, JAPAN, SEPTEMBER 1-5, 1964, AND KYOTO, JAPAN, SEPTEMBER 7, 8, 1964, PROCEEDINGS (Japanese Journal of Applied Physics, Supplement 1, vol. 4, 1965). [A66-27316 14-14] Conference sponsored by the International Commission for Optics, the Science Council of Japan, and the Japan Society of Applied Physics.

Tokyo, Japanese Journal of Applied Physics, 1965, p. 648-653.

21 refs.

The study of rare gases by means of a very long wide-band optical maser (1 to  $3.5 \mu$ ) has made it possible to observe most of the known transitions in this range and to identify 15 new stimulated transitions. Among the important results of this study should be mentioned oscillation of the transition  $3^3D-4^3P$  of helium and the obtention of oscillations for six transitions in the group  $2s-3p$  of neon. The discovery of another phenomenon, namely the existence of several "cascades" of stimulated transitions, both in the He-Ne mixture and in pure neon, made it possible to determine the excitation mechanisms in the discharges. These "cascades" also present the advantage of increasing the gain, and consequently the usable power of stimulated transitions of the near infrared. (Author)

**A66-27464**

DIVALENT RARE EARTH IONS IN ALKALINE EARTH HALIDE CRYSTALS.

Francis K. Fong (Radio Corporation of America, RCA Laboratories, Princeton, N. J.).

IN: CONFERENCE ON RARE EARTH RESEARCH, 4TH, PHOENIX, ARIZ., APRIL 22-25, 1964, PROCEEDINGS. [A66-27460 14-26]

Conference sponsored by the Arizona State University and the U.S. Air Force, Office of Scientific Research.

Edited by LeRoy Eyring.

New York, Gordon and Breach Science Publishers, Inc., 1965, p. 373-392. 20 refs.

Contract No. AF 33(657)-11221.

Methods of solid-state reduction of lanthanide ions in laser hosts such as calcium fluoride, strontium chloride, and barium bromide are described. Photochemically reduced (by gamma rays) lanthanide ions are metastable due to the presence of recombination hole-centers. Reoxidation of these ions occurs readily by absorption of light of appropriate frequencies or heat. Mechanisms for the photochemical and thermal reactions of dysprosium ions in calcium fluoride, in particular, are postulated. The effect of charge-compensation of  $Tm^{3+}$  ions by  $Na^+$  ions in strontium chloride upon the concentration of  $Tm^{3+}$  ions reducible by gamma rays is discussed. The reduction of trivalent lanthanide ions by additive calcium vapor or by solid-state electrolysis gives rise to divalent ions which are stable with respect to light and heat. Evidently, reduction by either of these two techniques occurs with the simultaneous elimination of recombination hole-centers. It is believed that diffusions of the halide ions is the rate-determining step. Possible mechanisms of such a diffusion process in the solid-state electrolytic reduction of lanthanide ions are discussed in some detail.

(Author)

**A66-27495**

PHOTOMETRIC FIGURES OF MERIT FOR SEMICONDUCTOR LUMINESCENT SOURCES OPERATING IN SPONTANEOUS MODE.

W. N. Carr (Texas Instruments, Inc., Semiconductor Research and Development Laboratory, Dallas, Tex.).

*Infrared Physics*, vol. 6, Apr. 1966, p. 1-19. 20 refs.

Figures of merit including radiant flux, radiant intensity, and radiance are expressed analytically in terms of geometry, internal

generation, and material constants for semiconductor sources. The calculations refer to spontaneous photogeneration within a thin, planar region of the semiconductor where photons are emitted in an isotropic spatial pattern with no appreciable coherence effects present. The excitation for the photogeneration may be a p-n junction, particle source, photomask, or other mechanism. Detailed calculations are presented for sources shaped as hemispheres and for two types of flat, rectangular geometries. Also considered are the Weierstrass sphere, truncated ellipsoid, truncated cone, and the paraboloid immersed sources. A quantitative comparison neglecting internal bulk absorption effects is tabulated for radiant flux, maximum and average radiant intensity, and maximum and average radiance. The quantitative comparisons refer to a semiconducting material with a refractive index of 3.6 and are expressed per unit of internal photogeneration flux or flux density. (Author)

#### A66-27507

##### LASER MEASUREMENT OF ELECTRON DENSITY IN DENSE, HIGH-TEMPERATURE PLASMA.

A. Boornard (Radio Corporation of America, Defense Electronic Products, Applied Research Section, Camden, N.J.), L. J. Nicastro, and J. Vollmer (Radio Corporation of America, Defense Electronic Products, Camden, N.J.).

IN: PLASMA PHYSICS RESEARCH AND ENGINEERING.

Camden, N.J., Radio Corporation of America, 1966, p. 26-30. 14 refs.

Description of a laboratory investigation in which coherent radiation from a laser is used to determine the electron density in a dense, high-temperature, high-velocity plasma stream. Temperatures in the range of 14,000 to 16,000°K are attainable in the potential core region of an argon plasma jet operating in the laminar mode. Because measurement of the electron concentration in such high temperature plasma by conventional probe and microwave techniques is very difficult, a technique was developed by which electron concentration measurements were obtained using a He-Ne two-cavity laser interferometer. Use is made of the 3.39- $\mu$  radiation to obtain a large phase shift; the visible 6328-Å radiation is used for alignment and detection. The effects of scattering of the laser radiation by the plasma jet when operated in the turbulent mode are reviewed. F.R.L.

#### A66-27576

##### OPTICAL OSCILLATION IN CdS UNDER THE ACTION OF TWO-PHOTON EXCITATION BY A RUBY LASER.

V. K. Koniukhov, L. A. Kulevskii, and A. M. Prokhorov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(Akademiia Nauk SSSR, Doklady, vol. 164, Oct. 11, 1965, p. 1012-1015.)

Soviet Physics - Doklady, vol. 10, Apr. 1966, p. 943-945. 16 refs. Translation.

[For abstract see issue 04, page 529, Accession no. A66-13874]

#### A66-27595 #

##### FAST-ACTING FLUID SEAL FOR Q-FACTOR MODULATION OF A NEODYMIUM GLASS LASER [ZHIDKOSTNYI BYSTRODEISTVUIUSHCHII ZATVOR DLIA MODULATSII DOBROTNOSTI OPTICHESKOGO KVANTOVOGO GENERATORA NA NEODIMOVOM STEKLE].

M. P. Vaniukov, O. D. Dmitrievskii, V. I. Isaenko, and V. A. Serebriakov.

Akademiia Nauk SSSR, Doklady, vol. 167, Mar. 21, 1966, p. 547, 548. 7 refs. In Russian.

Experimental investigation in which a bleachable absorber (an analog of the polymethine dye 3,3'-diethyl-9,11,15,17-dineopentylene-thia-pentacarbocyanine iodide) was placed in the optical cavity of a neodymium-doped glass laser. It is shown that the generation threshold of the resulting giant pulse and the energy of the pulse depend on the optical density of the solution. V.P.

#### A66-27605

##### PUMPING NEODYMIUM LASERS WITH RUBY-LASER LIGHT [PUMPEN VON NEODYMLASERN MIT RUBIN-LASERLICHT].

D. Röss and G. Zeidler (Siemens und Halske AG, Zentrallaboratorium, Munich, West Germany).

Zeitschrift für Naturforschung, Ausgabe A, vol. 21a, Mar. 1966, p. 336-340. In German.

Description of a high-efficiency method of pumping neodymium lasers through the use of coherent emission of ruby lasers. Using this method, the threshold energy of a YAG:Nd<sup>3+</sup> laser is found to be 10<sup>-4</sup> watt/mm<sup>2</sup>. The local dependence of the threshold energy and efficiency of an inhomogeneous CaWO<sub>4</sub>:Nd<sup>3+</sup> crystal is also determined. It is shown that by pumping with periodic light pulses with a wavelength of 0.69  $\mu$  periodic pulses with a wavelength of 1.06  $\mu$  can be created. A.B.K.

#### A66-27606

##### MODE SELECTION AND TRANSIENT BEHAVIOR OF A CONFOCAL CONTINUOUS RUBY LASER [MODESELEKTION UND EINSCHWINGVERHALTEN EINES KONFOKALEN, KONTINUIERLICHEN RUBINLASERS].

Dieter Röss and Günter Zeidler (Siemens und Halske AG, Zentral-laboratorium, Munich, West Germany).

Zeitschrift für Naturforschung, Ausgabe A, vol. 21a, Mar. 1966, p. 340-343. 8 refs. In German.

Study of the axial and transverse mode selection, emission spectrum, and transient emission behavior of a confocal ruby laser operated continuously at 300°K in an ellipsoidal pumping system. It is found that as the pumping power is increased higher-order transverse modes are emitted, owing to the increasing inverted cross section of the confocal resonator. In the presence of an excitation 20% above the threshold transverse modes of up to the 60th order coexist within an oscillating diameter of 1.5 mm and form a diffuse beam of high divergence. In the presence of a small excitation, with only the fundamental mode oscillating, the emission remains like that of a Fabry-Pérot, while in the presence of greater excitation, with an increase in the number of transverse modes the number of axial modes increases less rapidly than in the case of Fabry-Pérot lasers. A.B.K.

#### A66-27607

##### PRODUCTION OF ENERGY-RICH PLASMAS BY LIGHT PULSES [ERZEUGUNG ENERGIEREICHER PLASMEN DURCH LICHTIMPULSE].

H. OPOWER and W. Press (München, Technische Hochschule, Physik-Department, Munich, West Germany).

Zeitschrift für Naturforschung, Ausgabe A, vol. 21a, Mar. 1966, p. 344-350. 16 refs. In German.

Experimental study of the production of energy-rich plasmas by light pulses from a Q-switched laser with a peak power of 250 Mw and an energy of 3.5 joules focused on carbon and LiH targets in a vacuum chamber. A rapidly expanding plasma with nearly equal electron and ion expansion velocities is observed. From time-of-flight measurements particles with a maximum energy of 6.3 kev are found in the case of carbon and 1.7 kev in the case of LiH. The high values of the ion energies are said to result from an energy transfer from the electrons to the ions during the expansion process. This energy transfer is explained by a simple electrostatic model. A.B.K.

#### A66-27647 #

##### LASER-GENERATION-TYPE LUMINESCENCE OF CdS-CdSe CRYSTALS EXPOSED TO DOUBLE PHOTON EXCITATION FROM A RUBY LASER [SVITINNIA KRISTALIV CdS-CdSe TIPU LAZER-NOI GENERATSII PRI DVOFOTONNOMU ZBUDZHENNI IKH RUBINOVIM OKG.].

M. S. Brodin, M. I. Vitrikhovskii, S. V. Zakrevskii, and V. Ia. Reznichenko (Akademiia Nauk Ukrain's'koi RSR, Institut Fiziki i Institut Napirovodnikiv, Kiev, Ukrainian SSR). Ukrain's'kii Fizichnii Zhurnal, vol. 11, Mar. 1966, p. 344, 345. In Ukrainian.

Brief discussion of the results of an investigation of the luminescence spectrum produced by CdS-CdSe crystals subjected to double photon excitation from a ruby laser. All the samples showed a

narrow band sharply polarized both along and perpendicular to the hexagonal axis  $c$ . The width and position of the band are discussed.  
V. Z.

**A66-27668****PROTECT YOUR SIGHT FROM LASER LIGHT.**

Jesse C. Kaufman (General Precision, Inc., General Precision Aerospace Group, GPL Div., Pleasantville, N.Y.).  
Microwaves, vol. 5, Apr. 1966, p. 38-45.

Discussion of the serious hazard to the eyes of uninformed operators and bystanders of powerful lasers. Laser light can injure the eye by: (1) intense visible light which, easily transmitted into the eye, damages the retina, and (2) UV and IR radiation which tend to be absorbed by the cornea, lens, and vitreous humor, thus heating those tissues beyond the danger point. Fourteen precautions to take when working in the laboratory are enumerated, and a table gives the limits of safe exposure to laser light. An appendix gives examples of retinal irradiation.  
F.R.L.

**A66-27669****WHY LASERS FAIL - AND WHAT TO DO ABOUT IT.**

Glenn A. Hardaway (Applied Lasers, Inc., Stoneham, Mass.).  
Microwaves, vol. 5, Apr. 1966, p. 46-48, 52, 54.

Consideration of the major causes of failures of solid state lasers, giving design guidelines which - if followed - will permit designers to construct glass or ruby systems good for up to 500,000 discharges. Failures in ruby and glass lasers can often be traced to flash lamps, the laser rod, the cavity material, excessive heat in the lamp and rod, and dirt in the cavity or on components. Each of these possible causes is discussed in some detail, and methods of correction and prevention are suggested.  
F.R.L.

**A66-27750 #****MEASUREMENT OF THE TRANSIENT PARAMETERS OF A HIGH-POWER LASER WITH A PHOTODIODE.**

R. V. Ambartsumian, N. G. Basov, P. G. Eliseev, V. S. Zuev, P. G. Kriukov, and Iu. Iu. Stoilov.  
(Radiotekhnika i Elektronika, vol. 10, Sept. 1965, p. 1729, 1730.)  
Radio Engineering and Electronic Physics, vol. 10, Sept. 1965, p. 1487, 1488. Translation.  
[For abstract see issue 22, page 3290, Accession no. A65-34552]

**A66-27775****LASER SAFETY STANDARDS.**

Norman A. Peppers (Optics Technology, Inc., Research Dept., Palo Alto, Calif.).  
(Society of Photo-Optical Instrumentation Engineers, Technical Symposium, 10th, San Francisco, Calif., Aug. 19, 1965, Paper.)  
SPIE Journal, vol. 4, Feb.-Mar. 1966, p. 111-115. 15 refs.

Brief discussion of the nature of some of the photobiological mechanisms responsible for tissue damage in persons exposed to radiation from a wide variety of lasers. Laser radiation parameters which influence the degree of danger to ocular tissues are indicated, and threshold values are given. The difference between establishing safety criteria and suggesting safety procedures is defined. A brief account of some of the problems that must be solved before safety criteria can be established is given, and current safety procedures are discussed.  
M.M.

**A66-27821****DETECTION OF COHERENT OPTICAL RADIATION.**

Marvin E. Laesser (Philco Corp., Philadelphia, Pa.).  
IEEE Spectrum, vol. 3, Apr. 1966, p. 73-78. 18 refs.

Investigation of sensitive coherent detection techniques, identical in principle to the methods applicable to the rf or microwave regions, at optical wavelengths. It is noted that since the natural limit of being able to count individual photons is already

being approached in both the short-wavelength visible and near-ultraviolet regions, there is no possibility of improvement in these spectra. But at increased wavelengths, where detectors are several orders of magnitude away from being able to count photons, much higher sensitivity can be achieved through the use of coherent detection methods. It is shown that in optical superheterodyne detection the mixing in the superheterodyne receiver arises because optical detectors measure the intensity rather than the amplitude of the light waves, and thus square-law detection results.  
M. L.

**A66-27892 #****USE OF LIDAR IN ATMOSPHERIC RESEARCH.**

Ronald T. H. Collis (Stanford Research Institute, Radar Aerophysics Group, Menlo Park, Calif.).

(American Institute of Aeronautics and Astronautics, Annual Meeting, 2nd, San Francisco, Calif., July 26-29, 1965, Paper 65-464.)

Journal of Spacecraft and Rockets, vol. 3, Apr. 1966, p. 599-601. 10 refs.

Research sponsored by the Lear Siegler Corp., the Navy, and the Stanford Research Institute.

[For abstract see issue 19, page 2818, Accession no. A65-30204]

**A66-27958****OPTIMUM PITCH OF TRAVELING-WAVE MASERS.**

Erik Kollberg (Chalmers University of Technology, Research Laboratory of Electronics, Gothenburg, Sweden).

IEEE Transactions on Microwave Theory and Techniques, vol. MTT-14, Apr. 1966, p. 212, 213.

Theoretical demonstration of the existence of an optimum pitch giving maximum net gain for traveling-wave masers utilizing transverse-strip slow-wave structures. This demonstration is achieved by scaling all cross-sectional dimensions of the wave structure by multiplying them by a common factor. An expression is obtained for the optimum net gain as a function of the optimum pitch, which is shown to represent a compromise between the ohmic losses and the slowing factor.  
A.B.K.

**A66-27960****CHARACTERISTICS OF DIELECTRICALLY LOADED LADDER LINES FOR TRAVELING-WAVE MASERS AND OTHER APPLICATIONS.**

George I. Haddad (Michigan, University, Dept. of Electrical Engineering, Ann Arbor, Mich.).

IEEE Transactions on Microwave Theory and Techniques, vol. MTT-14, Mar. 1966, p. 120-129. 16 refs.  
Contract No. AF 33(615)-1553.

The characteristics of ladder lines are investigated in detail and the effects of the various dimensions of the ladder line and the enclosing structure on the  $\omega/\beta$  characteristic are presented. The effects of a dielectric material placed at different positions in the structure on the characteristics are also examined in detail. Dielectric materials selected for investigation have relative dielectric constants of 9, 100, and 256, characteristic of ruby and rutile, which have been shown to be good maser materials. It is shown that a nonpropagating easitron circuit may be made to propagate by loading it with a dielectric material, in which case the ridge in a Karp-type slow-wave structure may be eliminated. This results in a simple traveling-wave maser structure. The input impedance to the ladder-line structure and the structure ohmic loss have been evaluated and are presented in the figures. This information is useful in designing transducers to couple the power into and out of the structure, and gives an estimate of the expected ohmic loss in the structure.  
(Author)

**A66-27976****Ba(B<sub>0.5</sub>Ta<sub>0.5</sub>)O<sub>3</sub> ORDERED PEROVSKITE-TYPE COMPOUNDS - POSSIBLE NEW LASER HOST MATERIALS.**

F. S. Galasso, G. K. Layden, and D. E. Flinchbaugh (United Aircraft Corp., Research Laboratories, East Hartford, Conn.).  
Journal of Chemical Physics, vol. 44, Apr. 1, 1966, p. 2703-2707. 9 refs.

ARPA-Navy-DOD-sponsored research.

The trivalent ions of Nd, Sm, and Yb were incorporated into powders of ordered perovskite-type compounds having the general formula  $Ba(B_{0.5}Ta_{0.5})O_3$ , where B is a trivalent rare-earth cation,  $Ln^{3+}$ ,  $Y^{3+}$ , or  $Sc^{3+}$ . Fluorescent lifetimes measured employing these materials indicate that the lifetimes for  $Nd^{3+}$  fluorescence are not as dependent on crystalline field as those for  $Cr^{3+}$  fluorescence. Of the  $Nd^{3+}$ -doped phases studied,  $Ba(Gd_{0.48}Nd_{0.02}Ta_{0.5})O_3$  and  $Ba(Lu_{0.48}Nd_{0.02}Ta_{0.5})O_3$  were found to exhibit the longest lifetimes (800 and 850  $\mu$ sec, respectively, at 77°K). Preliminary studies show that single crystals of  $Ba(Y_{0.5}Ta_{0.5})O_3$  can be grown from a  $B_2O_3$  flux by slow cooling or by a modified Czochralski technique. Developing crystals of suitable quality for laser studies, however, requires further research. (Author)

#### A66-28037

##### SOME RECENT ADVANCES IN LASERS.

Osamu Harashima (Nippon Electric Co., Ltd., Kawasaki, Japan). *Electronics and Communications in Japan*, vol. 48, Jan. 1965, p. 21-30. 47 refs. Translation.

Outline of outstanding topics of recent laser studies. Fundamental problems of laser application are treated. Giant-pulse solid-state lasers, gas lasers, semiconductor lasers, and Raman lasers are treated, and applications of lasers to communications, ranging, materials processing, plasma studies, spectroscopy, and medicine are discussed. M. M.

#### A66-28044

##### ULTRASONIC MODULATION OF LASER OSCILLATION FROM $Nd^{3+}$ GLASS ROD.

Humio Inaba and Takao Kobayashi (Tonoku University, Research Institute of Electrical Communication, Sendai, Japan). *Electronics and Communications in Japan*, vol. 48, Jan. 1965, p. 103-105. 5 refs. Translation.

Consideration of a technique for obtaining periodic laser pulses by internally modulating a ruby laser with an ultrasonic signal using a magnetostrictive element. It is shown that this technique is applicable to solid-state lasers in general, and experimental results using a glass laser (Ba crown glass) containing  $Nd^{3+}$  ions are reported. The output characteristics of the internally modulated laser signal with wavelength of 1.06  $\mu$  and the characteristics of axial modes measured by observing the microwave beats using a photomixing technique are discussed. M. M.

#### A66-28160 #

##### SELECTION OF OSCILLATION TYPES IN A GAS-LASER SEMI-CENTRIC RESONATOR [SELEKTSIA TIPOV KOLEBANII V POLUKONTSENTRICHESKOM REZONATORE GAZOVOGO OPTICHESKOGO GENERATORA].

A. V. Korovitsyn, L. V. Naumova, and Z. T. Lebedinskaya. *Radiotekhnika i Elektronika*, vol. 11, Apr. 1966, p. 668-674. In Russian.

Evaluation of the possibility of selecting desirable oscillation types for a gas-laser semiconcentric resonator. The output power and the structure of the radiation spectrum of such lasers are investigated as a function of resonator length. It is shown that the generation of transverse oscillations of a single basic type is feasible for a given resonator length. The diffraction losses of a semiconcentric resonator are calculated. V. Z.

#### A66-28166 #

##### CONTRIBUTION TO THE THEORY OF THE TWO-PHOTON LASER [K TEORII DVUKH FOTONNOGO LAZERA].

A. V. Uspenskii. *Radiotekhnika i Elektronika*, vol. 11, Apr. 1966, p. 766, 767. In Russian.

Analysis of the performance of a two-photon laser operating in the continuous-wave mode. It is shown that operation of a two-photon laser in the pulsed mode can be achieved if the duration of the "startup" pulse is longer than the pulse period and longer than the stabilization period in the resonator. A formula derived for

the pulse frequency indicates that this frequency increases rapidly with increasing initial number of particles in the resonator. V. P.

#### A66-28262

##### INTERACTION OF OPTICALLY COUPLED GaAs p-n JUNCTION LASERS.

N. G. Basov, Iu. P. Zakharov, V. V. Nikitin, and A. A. Sheronov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR). (*Fizika Tverdogo Tela*, vol. 7, Nov. 1965, p. 3460, 3461.) *Soviet Physics - Solid State*, vol. 7, May 1966, p. 2796, 2797. Translation.

[For abstract see issue 04, page 533, Accession no. A66-14363]

#### A66-28269

##### COMPARISON BETWEEN TWO MEASUREMENT TECHNIQUES FOR A PLASMA IN RAPID EXPANSION [COMPARAISON ENTRE DEUX TECHNIQUES DE MESURE SUR UN PLASMA EN EXPANSION RAPIDE].

Edouard Fabre and Pierre Vasseur (Ecole Polytechnique, Laboratoire de Physique, Paris, France). *Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques*, vol. 262, no. 14, Apr. 4, 1966, p. 923-925. In French.

Comparison of electrostatic-probe measurements of the velocity displacement and electron density of a plasma (produced by focusing the energy emitted by a laser on a solid target in a vacuum) and plasma electron density measurements obtained with an 8-mm microwave interferometer. A passively-triggered ruby laser with an energy output of 1 joule and peak power output of  $5 \times 10^7$  watts was used. The copper target was placed in a spherical glass container in which three electrostatic probes were located at 12, 38, and 72 mm from the point of focus, while the 8-mm microwave interferometer enabled the dephasing of the light in passing through the expanding plasma to be measured. The electron density measured with the interferometer was slightly higher than that observed with the probes and was equal to  $1.5 \times 10^{13}/\text{cm}^3$ . D. P. F.

#### A66-28289 #

##### AN ATOMIC HYDROGEN BEAM MASER.

N. G. Basov, G. M. Strakhovskii, A. I. Nikitin, T. F. Nikitina, V. M. Tatarenkov, and A. V. Uspenskii. (*Radiotekhnika i Elektronika*, vol. 10, Oct. 1965, p. 1809-1813.) *Radio Engineering and Electronic Physics*, vol. 10, Oct. 1965, p. 1551-1554. 6 refs. Translation.

[For abstract see issue 03, page 380, Accession no. A66-13316]

#### A66-28291 #

##### MEANDER-LINE TYPE SLOW-WAVE STRUCTURE WAVE DISPERSION IN THE STUB SLOW-WAVE STRUCTURE OF PARAMAGNETIC AMPLIFIER.

G. S. Misozhnikov. (*Radiotekhnika i Elektronika*, vol. 10, Oct. 1965, p. 1856.) *Radio Engineering and Electronic Physics*, vol. 10, Oct. 1965, p. 1588-1595. 5 refs. Translation.

Derivation of expressions for the dispersion characteristic of the partially dielectric-filled stub slow-wave structure of a traveling-wave maser. Incomplete filling of the cross section of such a structure with dielectric causes significant alteration in the shape of the dispersion characteristic, making it possible in a number of cases to increase the slowing factor of the wave with respect to its group velocity and thereby to increase the gain factor of a traveling-wave maser. This makes it possible to obtain a nearly maximal utilization factor of the high-frequency magnetic field and to avoid the excitation of parasitic wave modes in the structure. R. A. F.

#### A66-28358 #

##### PARAMETRIC AMPLIFIERS AND LASERS [PARAMETRICHESKIE USILITELI I GENERATORY SVETA].

S. A. Akhmanov and R. V. Khokhlov (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). (*Uspekhi Fizicheskikh Nauk*, vol. 88, Mar. 1966, p. 439-460. 48 refs.) In Russian.

Extensive review of the latest developments in quantum electronics and laser technology, centered on the problem of creation of adjustable lasers with smoothly variable parameters. Generation and amplification of subharmonics within the optical range, parametric interactions, and forced scattering are the specific topics discussed at length. V. Z.

**A66-28404 #**

**OPTICAL SUBCARRIER COMMUNICATIONS.**

J. H. Ward, III and M. L. Shechet (International Telephone and Telegraph Corp., ITT Federal Laboratories Div., San Fernando, Calif.).

IN: THE CHALLENGE OF SPACE; PROCEEDINGS OF THE THIRD SPACE CONGRESS, COCOA BEACH, FLA., MARCH 7-10, 1966. [A66-28401 14-30]

Congress sponsored by the Canaveral Council of Technical Societies, Cocoa Beach, Fla., Canaveral Council of Technical Societies, 1966, p. 33-49, 5 refs.

Discussion of the use of rf subcarriers placed on optical beams for communication purposes. Through the use of advanced optical beam processing and postdetection electronic processing, the advantages of optical frequency techniques can be combined with the mature background of the rf technology. These techniques are expected to find applications for long-range, wide-band communication, spacecraft tracking and rendezvous, and altimetry, as well as for aircraft and spacecraft landing aids. M. F.

**A66-28448 =**

**PRECISION AUTOMATIC TRACKING USING A CW LASER.**

E. L. McGann (Sylvania Electric Products, Inc., Sylvania Electronic Systems Div., Applied Research Laboratory, Waltham, Mass.).

IN: THE CHALLENGE OF SPACE; PROCEEDINGS OF THE THIRD SPACE CONGRESS, COCOA BEACH, FLA., MARCH 7-10, 1966. [A66-28401 14-30]

Congress sponsored by the Canaveral Council of Technical Societies, Cocoa Beach, Fla., Canaveral Council of Technical Societies, 1966, p. 583-597, 13 refs.

Description of the design and performance of a precision CW laser tracker. When tracking low acceleration targets such as satellites and aircraft, it has an accuracy of about  $25\mu\text{rad rms}$ . When tracking high acceleration targets, it has a tracking error essentially proportional to the relative angular acceleration. The facility can measure range to the target, and its tracking accuracy, especially at low altitudes, exceeds that of a high-performance radar. The optical and servo control system of the tracker is described, and aircraft, rocket, and satellite tracking tests are discussed. Finally, such system parameters as SNR, range parameters, errors in closed-loop tracking systems, and radiation background discrimination are treated mathematically, and the effects of atmospheric turbulence and refraction on the tracking system are mentioned. B. B.

**A66-28580**

**MULTIPLE SCATTERING OF OPTICAL RADIATION WITH APPLICATION TO LASER COMMUNICATIONS.**

Robert A. Dell-Imagine (North American Aviation, Inc., Autonetics Div., Anaheim, Calif.).

IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, 1965 INTERNATIONAL ANTENNA AND PROPAGATION SYMPOSIUM, WASHINGTON, D. C., AUGUST 30-SEPTEMBER 1, 1965. PROGRAM AND DIGEST. [A66-28566 15-09]

Symposium supported by the U.S. Air Force and the U.S. Navy, New York, Institute of Electrical and Electronics Engineers, Inc., 1965, p. 112-116. Abridged. Grant No. AF AFOSR 700-65.

Results from an investigation to determine the effects of scattering on the propagation of coherent optical signals. A mathematical model is developed for the optical communication, and the equation of radiative transfer is simulated on a digital computer, based on the model. A sample application of the theory is given. R. A. F.

**A66-28581**

**MEASUREMENTS OF OPTICAL BEAMS PROPAGATED THROUGH THE ATMOSPHERE.**

T. S. Chu (Bell Telephone Laboratories, Inc., New York, N. Y.).

IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, 1965 INTERNATIONAL ANTENNA AND PROPAGATION SYMPOSIUM, WASHINGTON, D. C., AUGUST 30-SEPTEMBER 1, 1965. PROGRAM AND DIGEST. [A66-28566 15-09]

Symposium supported by the U.S. Air Force and the U.S. Navy, New York, Institute of Electrical and Electronics Engineers, Inc., 1965, p. 117-122. Abridged.

Results from measurements of the propagation of a  $0.63\mu$  maser beam through the atmosphere over a distance of 2.6 km. Primary attention is given to beam broadening and signal fluctuation due to clear-air turbulence. The data obtained are interpretable in terms of random temperature fluctuations in the atmosphere and are considered of use for estimating the parameters of theoretical models. R. A. F.

**A66-28600 #**

**LIDAR - A NEW ATMOSPHERIC PROBE.**

R. T. H. Collis (Stanford Research Institute, Menlo Park, Calif.).

Royal Meteorological Society, Quarterly Journal, vol. 92, Apr. 1966, p. 220-230, 23 refs.

Research sponsored by the Lear Siegler Corp. and the Stanford Research Institute; Contract No. Nonr-4471(00).

Pulsed-light techniques of probing the atmosphere have been greatly extended by employing lasers as energy sources in instruments called "lidars." Because of the nature of laser energy and the manner in which it is used in current and proposed systems, lidar is best discussed in terms of radar. Apart from the basic capabilities of lidar for detecting backscattering from atmospheric constituents, possibilities exist for more sophisticated techniques based on the wave nature of the energy. The basic capabilities of lidar, however, make it possible to observe the atmosphere with previously unknown resolution and sensitivity. Apart from providing new information about clouds, lidar has shown that the concentration of the particulate matter content of clear air is highly variable and that such variations can indicate the structure and motion of the clear atmosphere. These capabilities have applications in atmospheric and meteorological research and various operational activities. (Author)

**A66-28607**

**TWO-STAGE EXCITATION OF THE PHOSPHORESCENCE OF RUBY.**

Z. L. Morgenshtern and V. B. Neustruev (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

Physica Status Solidi, vol. 14, no. 2, 1966, p. 303-310, 25 refs.

A long-time phosphorescence of ruby is found under intense optical excitation in the spectral region of the R lines. From the initial brightness decay, as a function of the intensity and wavelength of the exciting light, it is suggested that the phosphorescence has a recombination character. The long-wavelength limit of excitation corresponds to about 2 eV. These results indicate a complex character for the phosphorescence excitation (two-photon or two-step). To differentiate between these two possibilities experiments are performed using two excitation pulses with various time delays between them. These experiments show that two-step excitation of electrons into the conduction band of ruby takes place over  $2E$  levels of the Cr ions. From the results, and absorption data of ruby and corundum, a band scheme is proposed which explains the long-wavelength limit of phosphorescence excitation in terms of indirect transitions. (Author)

**A66-28626**

**MEDIUM IN THE ELECTROMAGNETIC FIELD OF A LASER BEAM CONSIDERED AS AN OPTICAL LATTICE [EIN MEDIUM IM ELEKTROMAGNETISCHEN FELD EINER LASERWELLE ALS OPTISCHES GITTER].**

R. Enderlein (Humboldt-Universität, Institut für theoretische Physik, Berlin, East Germany).

Physica Status Solidi, vol. 14, no. 1, 1966, p. 97-108. In German.

Study of the transmission of light through the optical-diffraction lattice constituted by a medium in the electromagnetic field of a laser beam. Using an approximation solution to Maxwell's equations, expressions are obtained for the first-order diffraction intensities.

R.A.F.

#### A66-28627

##### TRANSVERSE GAIN IN GaAs LASER STRUCTURES.

G. J. Burrell, T. S. Moss, and A. Hetherington (Ministry of Aviation, Royal Aircraft Establishment, Farnborough, Hants., England).

*Physica Status Solidi*, vol. 14, no. 1, 1966, p. 109-113.

Gain measurements for radiation of wavelength  $8466 \text{ \AA}$  propagating in  $x$  direction perpendicular to the junction of a GaAs injection laser operated at  $80^\circ\text{K}$ . Combined with measurements of spontaneous emission, the results show that a gain of 2.3% is achieved at  $7000 \text{ amp/cm}^2$ . In thermal equilibrium, 0.78% of the transmitted radiation is absorbed in traversing the active region,  $135 \text{ amp/cm}^2$  being required to offset this loss before net gain is obtained.

R.A.F.

#### A66-28685

##### TWO WAVELENGTH INTERFEROMETRY OF A LASER-INDUCED SPARK IN AIR.

A. J. Alcock and S. A. Ramsden (National Research Council, Div. of Pure Physics, Ottawa, Canada).

*Applied Physics Letters*, vol. 8, Apr. 15, 1966, p. 187, 188. 5 refs.

Determination of the electron density in a laser-induced spark in air by simultaneous measurements at both the fundamental laser wavelength and its second harmonic. Using a rotating-prism, Q-spoiled ruby laser to produce an air spark in one arm of the interferometer and a second Q-spoiled ruby laser to illuminate the interferometer, simultaneous interferograms are obtained at the fundamental wavelength and the second harmonic, and, on the basis of the fringe shift detected, the average value of the electron density is determined.

A.B.K.

#### A66-28689

##### OPTICAL BEAM DEFLECTOR.

W. E. Buck and T. E. Holland (Beckman and Whitley, Inc., Mountain View, Calif.).

*Applied Physics Letters*, vol. 8, Apr. 15, 1966, p. 198, 199.

Description of an optical-beam deflection technique employing an interferometer cavity illuminated with a gas laser beam. The proposed beam deflector is distinguished by the fact that it contains optical means for imaging the entrance mirror on the exit mirror and a means for changing the optical path length of the cavity.

A.B.K.

#### A66-28690

##### EFFICIENT, HIGH-POWER COHERENT EMISSION FROM $\text{Ho}^{3+}$ IONS IN YTTRIUM ALUMINUM GARNET, ASSISTED BY ENERGY TRANSFER.

L. F. Johnson, J. E. Geusic, and L. G. Van Uitert (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

*Applied Physics Letters*, vol. 8, Apr. 15, 1966, p. 200-202. 8 refs.

Results of experiments in improving the coherent emission from  $\text{Ho}^{3+}$  ions in rare-earth-substituted YAG. Three energy-transfer combinations in YAG are reported: (1)  $\text{Yb}^{3+} \rightarrow \text{Tm}^{3+}$ , (2)  $\text{Yb}^{3+} \rightarrow \text{Ho}^{3+}$ , and (3)  $\text{Tm}^{3+} \rightarrow \text{Ho}^{3+}$ . It is found that when  $\text{Er}^{3+}$ ,  $\text{Yb}^{3+}$ , and  $\text{Tm}^{3+}$  are incorporated simultaneously in YAG along with  $\text{Ho}^{3+}$  ions, they all transfer energy to  $\text{Ho}^{3+}$ . This finding is utilized to obtain 7.6 watts of coherent emission at  $2.123 \mu$  with 550 watts of power into a tungsten lamp. An actual coherent output of 15 watts for a corrected power input of 300 watts is obtained, yielding an efficiency of 5%.

A.B.K.

#### A66-28691

##### HIGH-RESOLUTION ABSORPTION MEASUREMENT IN $\text{CO}_2$ WITH A TUNED LASER.

B. F. Jacoby and R. K. Long (Ohio State University, Dept. of Electrical Engineering, Antenna Laboratory, Columbus, Ohio). *Applied Physics Letters*, vol. 8, Apr. 15, 1966, p. 202-204. 8 refs. NSF-supported research.

Measurement of a single line in the P branch of the  $\text{CO}_2$   $1310$  to  $01^0$  vibro-rotational absorption band near  $2 \mu$ , using the technique of tuned optical maser spectroscopy. It is found that only one set of shifted frequencies  $\sigma_{\pm}$  is present in this maser transition, and it is believed, in addition, that either maser operation occurs on only one of the two possible  $\sigma_{\pm}$  transitions, or else the  $g$ -values for the upper and lower maser energy levels are nearly identical. A  $g$ -factor of approximately 1.06 is obtained for the  $1.27$ -torr absorption line.

A.B.K.

#### A66-28692

##### A NEW TECHNIQUE FOR MEASURING MAGNITUDES OF PHOTO-ELASTIC TENSORS AND ITS APPLICATION TO LITHIUM NIOBATE.

R. W. Dixon and M. G. Cohen (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

*Applied Physics Letters*, vol. 8, Apr. 15, 1966, p. 205-207. 10 refs.

Description of a relatively simple technique for making accurate, direct measurements of the photoelastic constants of a solid, relative to the large component of fused quartz. The technique, which is illustrated by measurements in a single crystal of lithium niobate, consists in scattering an optical beam from a  $6328\text{-\AA}$  He-Ne gas laser with pulsed ultrasound, first as the beam traverses a fused quartz buffer rod, and then as it traverses the sample crystal, which is bonded to the quartz.

A.B.K.

#### A66-28695

##### TEMPERATURES, LORENTZIAN WIDTHS, AND DRIFT VELOCITIES IN THE ARGON-ION LASER.

E. A. Ballik, W. R. Bennett, Jr., and G. N. Mercer (Yale University, Dunham Laboratory, New Haven, Conn.).

*Applied Physics Letters*, vol. 8, Apr. 15, 1966, p. 214-216. 10 refs. USAF-Army-supported research.

Measurement of temperatures, Lorentzian widths, and drift velocities of excited neutral and ionic species in an argon-ion laser as a function of  $E/p_0$ . It is found that thermal equilibrium between neutral and ion velocity distributions is only approached at filling pressures considerably above those for optimum inversion density. The Lorentzian widths for ion transitions are found to exceed the natural widths by large factors, indicating that phase interruption occurs primarily through a nonradiative process. It is observed that above  $\approx 50 \text{ v/cm-torr}$  the Lorentzian widths for the neutral lines increase with  $E/p_0$  due to Stark broadening and may be used as a measure of the electron-ion density. All ionic states observed are said to show effective drift velocities which saturate with increasing  $E/p_0$  and go through maxima somewhat below the region of optimum inversion density.

A.B.K.

#### A66-28699

##### LASER-INDUCED PERTURBATIONS OF EXCITED-STATE POPULATIONS IN A He-Ne DISCHARGE.

L. A. Weaver and R. J. Freiberg (Illinois, University, Gaseous Electronics Laboratory, Urbana, Ill.).

*Journal of Applied Physics*, vol. 37, Mar. 15, 1966, p. 1528-1535. 21 refs.

Contract No. AF 19(628)-3307.

Radiative cascade patterns in noble gases are described by an idealized theoretical model. Assuming a pure  $j-1$  coupling of angular momenta, branching ratios for spontaneous decays are computed using the Coulomb approximation of Bates and Damgaard. The computations are compared with the results of experiments on He-Ne gas lasers, in which oscillation serves as a selective perturbation of excited state populations in the active laser medium. Populations can be monitored spectroscopically through radiative transition rates, and good agreement with predicted decay patterns is found for the  $3.39\text{-}\mu$ ,  $6328\text{-}\mu$ , and  $1.15\text{-}\mu$  transitions in neon. Observed deviations from idealized  $j-1$  coupling behavior indicate

that population distributions are substantially altered by the collisional mixing of excited neon levels. Furthermore, electron impact with  $\text{Ne}(3s2)$  atoms is shown to be an important excitation mechanism for high-lying neon levels, since they are quenched by up to 3.7% during laser. When collisional processes are considered, the j-l coupling model adequately explains observed changes in line intensity. It is suggested that infrared lasers can be aligned conveniently by monitoring visible sidelight, and that noble-gas laser transitions of doubtful term assignment can be identified accurately by observing laser-induced decay patterns. (Author)

**A66-28701****THERMAL DEPENDENCE OF RUBY LASER EMISSION.**

Jerald R. Izatt, Robert C. Mitchell, and Harold A. Daw (New Mexico State University, University Park, N. Mex.).  
*Journal of Applied Physics*, vol. 37, Mar. 15, 1966, p. 1558-1562. 7 refs.

ARPA-Navy-DOD-supported research.

The temperature shift of ruby laser emission has been measured interferometrically for temperatures between 66° and 210°K. Representative values of the temperature shift coefficient are 0.004 Å/K° at 66°K, 0.014 Å/K° at 100°K, and 0.046 Å/K° at 200°K. These results are in excellent agreement with calculations by McCumber and Sturge which were based on Raman scattering of Debye-model phonons. The experimental technique for measuring the wavelength shifts is described in detail, and the results are compared with earlier measurements of the temperature dependence of ruby  $R_1$  absorption and ruby laser emission. (Author)

**A66-28727** **$\text{Nd}^{3+}$  GLASS LASER EXHIBITING REGULAR SPIKES.**

R. Polloni, C. A. Sacchi, and O. Svelto (Milano, Politecnico, Istituto di Fisica, Milan, Italy).  
*Journal of Applied Physics*, vol. 37, Mar. 15, 1966, p. 1931, 1932. 8 refs.

Research supported by the Consiglio Nazionale delle Ricerche.

Brief description of an experimental study on an  $\text{Nd}^{3+}$  glass laser exhibiting regular spikes. Regular spikes in the light output were observed from threshold up to ~80% above threshold (the flashtube limit). The best regularity was found to be obtained with a mirror separation slightly less (~5%) than concentric; a typical result is plotted. The relaxation oscillations were seen to develop subharmonics; it was observed that subharmonics were more in evidence when the rod was warm (~30°C); when the rod was cool (~15°C), subharmonics tended to disappear. B. B.

**A66-28732****LASER-INDUCED DAMAGE THRESHOLDS FOR VARIOUS GLASSES.**

John Martinelli (Eastman Kodak Co., A & OD Research Dept., Rochester, N. Y.).  
*Journal of Applied Physics*, vol. 37, Mar. 15, 1966, p. 1939, 1940.

Determination of damage thresholds for some commercial glasses made by Kodak and three other glass manufacturers, as well as for some experimental Kodak laser glasses. The emphasis in this work was on internal damage, and values were obtained for the traveling wave case. The threshold energies were obtained by focusing a gradually increasing laser pulse into various glasses until damage was observed. A silicate glass laser was used to supply pulses of 0.5 to 25.0 joules of 720 to 920- $\mu\text{sec}$  time durations. The damage thresholds for the various glasses are tabulated, and the experimental setup is diagramed. B. B.

**A66-28834****OPTICAL STUDY OF THE BEAM EMITTED BY A HIGH-INTENSITY LASER [ETUDE OPTIQUE DU FAISCEAU EMIS PAR UN LASER DE GRANDE INTENSITE].**

J. de Metz, A. Terneaud, and P. Veyrie (EURATOM and Commissariat à l'Energie Atomique, Villeneuve-Saint-Georges, Seine-et-Oise, France).

*Applied Optics*, vol. 5, May 1966, p. 819-822. 15 refs. In French.

Description of a method for determining the intensity distribution at the focus of a high-power laser. The laser consisted of an oscillator triggered by a rotating prism followed by four stages of

amplification. The active medium was glass doped with 5% of neodymium ions. The three parameters determining the characteristics of a laser beam are the duration of the emission, the energy density, and the beam divergence. The first two parameters are easily measured by conventional techniques. Beam divergence can be defined in terms of uniformity of illumination, the shape of the wavefront, and the spectral width. It is shown that when the effects caused by the concentration of a laser beam on a target are considered the energy source must be treated together with the focusing device.

D. P. F.

**A66-28835****LASER WAVELENGTH STABILIZATION WITH A PASSIVE INTERFEROMETER.**

Morley S. Lipsett and Paul H. Lee (Perkin-Elmer Corp., Norwalk, Conn.).

*Applied Optics*, vol. 5, May 1966, p. 823-826.

A control system has been devised for stabilizing the output wavelength of a laser by reference to an external passive optical element. This element, consisting of two spherical mirrors, forms an off-axis resonator that, when broadly illuminated by a laser beam, functions as a wavelength-sensitive discriminator. The stabilization control loop is closed by using a signal from this discriminator to tune the laser by moving one of its mirrors with a piezoelectric transducer. The error signal is proportional to changes in wavelength of the incident laser beam and is derived from the discriminator without deliberate frequency or amplitude modulation of the laser. The optical arrangement does not return any light in the direction of the source and thus avoids wavelength pulling due to spurious reflections. Two independent helium-neon lasers operating at 6328 Å were stabilized against a common reference interferometer using this system. Their relative stability was studied by heterodyning the two outputs and analyzing the beat spectrum. Each feedback loop had a gain of 60 db at dc falling off to 46 db at 200 cps and to 20 db at 2 kc. The resulting wavelength stability was about  $\Delta\lambda/\lambda = 2 \times 10^{-10}$ . The residual instability was mainly owing to room noise occurring at frequencies above the response of the feedback loops. (Author)

**A66-28836****CHEMICAL PUMPING THROUGH THERMAL DECOMPOSITION OF DIMETHYL PEROXIDE.**

J. R. Henderson and M. Muramoto (Douglas Aircraft Co., Inc., Solid State Physics Branch, Santa Monica, Calif.).

*Applied Optics*, vol. 5, May 1966, p. 831-834. 8 refs.

Description of a search for chemically pumped UV laser action in  $\text{H}_2\text{CO}$  due to the thermal decomposition of  $\text{CH}_3\text{OOCH}_3$ . Spectra are given for electrode ac discharges and rf electrodeless discharges of  $\text{H}_2\text{CO}$  and  $\text{CO}$  augmented by chemical excitation via the reaction  $\text{CH}_3\text{OOCH}_3 \rightarrow 2\text{CH}_3\text{O} \rightarrow \text{CH}_3\text{OH} + \text{H}_2\text{CO}^*$ . The rate of production of excited-state  $\text{H}_2\text{CO}$  through thermal decomposition of  $\text{CH}_3\text{OOCH}_3$  is estimated by analysis of the kinetics of the reaction to be  $2.3 \times 10^{18} \text{ cm}^{-3} \text{ sec}^{-1}$ . The population inversion  $\Delta F$  of  $\text{H}_2\text{CO}$  required to produce stimulated emission in the 4231-Å vibronic line is calculated to be  $3 \times 10^{14} \text{ cm}^{-3}$ , as compared to an available  $\Delta F$  of  $1.4 \times 10^{14} \text{ cm}^{-3}$ . The possibility of using this thermal decomposition to produce excited collision partners for inducing laser action in other molecular or atomic species is discussed. R. A. F.

**A66-28843****PERSPECTIVE RENDERING OF THE FIELD INTENSITY DIFFRACTED AT A CIRCULAR APERTURE.**

Leo Beiser (Columbia Broadcasting System, Inc., CBS Laboratories, Intelligence Systems Dept., Stamford, Conn.).

*Applied Optics*, vol. 5, May 1966, p. 869, 870.

Examination of the detailed focusing characteristics of diffraction-limited in high-information-density, laser-scanning technology. In order to add insight to the significance of the focal region data, particularly with respect to the depth-of-focus criteria, the field intensity was rendered in perspective. For the case of a round aperture illuminated by uniform flux, the central array of rings is the familiar Airy disk. Focal tolerance is represented by the ellipticity of the central spot. Freedom from spherical aberration is represented by symmetry about the focal point. D. P. F.

**A66-28877****RF INDUCTION EXCITATION OF CW VISIBLE LASER TRANSITIONS IN IONIZED GASES.**

J. P. Goldsborough, E. B. Hodges, and W. E. Bell (Spectra-Physics, Inc., Mountain View, Calif.).

Applied Physics Letters, vol. 8, Mar. 15, 1966, p. 137-139.

Observation that the previously reported pulsed toroidal or ring discharge excitation of gas ion lasers has been extended to drive high-power CW laser transitions in  $\text{Ar}^+$ ,  $\text{Kr}^+$ ,  $\text{Cl}^+$ , and  $\text{Br}^+$ . The configuration of typical tube is illustrated. The operating parameters of these CW lasers, such as gas pressure, voltage drop, and effect of axial magnetic field, are similar to those of dc-excited plasmas. A plot of typical power output vs rms current is shown. The maximum power output obtained to date is 1.4 watt from 5 lines in  $\text{Ar}^+$  with about 1400 watt input to the capillary. It is concluded that this method of plasma induction heating appears to have several advantages over dc arcs: a substantial reduction of capillary bore erosion, gas cleanup, electrode sputtering, gas pumping, and the ability to excite chemically reactive gases. M. L.

**A66-28880****LASER OSCILLATION IN ATOMIC Cl IN HCl AND HI GAS DISCHARGES.**

S. M. Jarrett, J. Nuñez, and G. Gould (TRG, Inc., Melville, N. Y.).

Applied Physics Letters, vol. 8, Mar. 15, 1966, p. 150, 151. 6 refs. Contract No. AF 49(638)-1535.

Observation of three new 3d to 4p laser transitions in Cl produced by means of high-current, pulsed discharges in HCl. The earlier observation of CW infrared laser oscillation in neutral Br and I produced in an ac glow discharge in the hydrogen halides HBr and HI is noted. The new laser lines, produced with short pulse excitation, are at 2.4466  $\mu$ , 1.3891  $\mu$ , and 1.3859  $\mu$ . The use of the two power supplies that allowed the observation of oscillation in Cl on a pulsed basis are described. A partial energy level diagram for neutral atomic chlorine is included. M. L.

**A66-28881****STIMULATED RAMAN EFFECT IN ACETONE AND ACETONE-CARBON-DISULFIDE MIXTURES.**

Georges G. Bret (Compagnie Générale de Télégraphie sans Fil, CEPCA, Orsay, Seine-et-Oise, France) and Marguerite M. Denariez (Paris, Université, Laboratoire de Chimie Physique, Orsay, Seine-et-Oise, France).

Applied Physics Letters, vol. 8, Mar. 15, 1966, p. 151-154. 12 refs.

Research supported by the Direction Générale pour la Recherche Scientifique et Technique.

Consideration of further evidence that Stokes radiation emitted in acetone closely follows the theory of the stimulated Raman effect and that the observed gain is in agreement with that predicted from the measured value of the Raman peak cross section. It is found that in acetone the most intense Raman line corresponds to the C-H vibration with a 2921- $\text{cm}^{-1}$  frequency and 18- $\text{cm}^{-1}$  line width. The measured value of the differential Raman cross section is found to be  $(8 \pm 4) \times 10^{-30} \text{ cm}^2$ . A plot of the power emitted at the first Stokes line of acetone vs laser intensity is included. M. L.

**A66-28884****MEASUREMENT OF VERY RAPID CHANGES IN LATENT-IMAGE STABILITY AGAINST HERSCHEL BLEACHING WITH LASERS.**

F. C. Strome (Eastman Kodak Co., Research Laboratories, Rochester, N. Y.).

Photographic Science and Engineering, vol. 10, Mar.-Apr. 1966, p. 81-83. 7 refs.

An investigation was made of the dependence of the magnitude of Herschel bleaching in a photographic emulsion upon the delay between the forward and bleaching exposures, with ruby and neodymium lasers as sources of bleaching radiation. Increasing Herschel effect was found for decreasing delays down to a delay of 100  $\mu\text{sec}$ . Attempts to investigate shorter delays, by using giant laser pulses, were thwarted by the generation of forward effect by these pulses. Some experimental results were obtained in support of possible explanations of this forward effect. (Author)

**A66-28930****REMOTE MEASUREMENT OF DIFFERENTIAL ATMOSPHERIC VELOCITY.**

R. C. Breese, D. L. Fried, and J. B. Seidman (North American Aviation, Inc., El Segundo, Calif.).

IN: INSTITUTE OF NAVIGATION AND SOCIETY OF AUTOMOTIVE ENGINEERS, NATIONAL AIR MEETING ON CLEAR AIR TURBULENCE, WASHINGTON, D. C., FEBRUARY 23, 24, 1966, PROCEEDINGS. [A66-28911 15-20]

Meeting sponsored by the Institute of Navigation and the Society of Automotive Engineers.

New York, Society of Automotive Engineers, Inc., 1966, p. 135-162. 8 refs.

Contract No. AF 19(628)-5135.

A concept for detection of clear air turbulence utilizing the Doppler frequency shift in laser light backscattered from atmospheric aerosol is described. The concept employs detection of beat frequencies in the output current of a photodetector resulting from photomixing the backscattered light from two laser pulses illuminating separated volumes of air. Analysis of the spectral and coherence properties of scattered light is given which proves that the basic phenomenon exists. The realizability of a practical system depends upon sufficient aerosol densities and higher performance lasers to achieve adequate S/N at useful distances. (Author)

**A66-28971****SOLAR-PUMPED MODULATED LASER**

C. W. Reno (Radio Corporation of America, Defense Electronic Products, Camden, N. J.).

RCA Review, vol. 27, Mar. 1966, p. 149-157. 5 refs.

Contract No. NAS 9-3671.

Description of the solar pumping and modulation of  $\text{CaF}_2:\text{Dy}^{2+}$ ,  $\text{YAG}:\text{Nd}^{3+}$ , and  $\text{YAG}:\text{Nd}^{3+}:\text{Cr}^{3+}$  lasers. The inherent advantages and disadvantages of each laser are described. The transmission of a television picture using a gallium arsenide electrooptic modulator and a solar pumped  $\text{YAG}:\text{Nd}^{3+}$  laser is reported. M. M.

**A66-29009****SUBMILLIMETER GAS LASER.**

G. T. Flesher and W. M. Muller (General Motors Corp., Defense Research Laboratories, Goleta, Calif.).

IEEE, Proceedings, vol. 54, Apr. 1966, p. 543-546. 6 refs.

Description of the characteristics of a laser operating in the submillimeter wave region. The laser is capable of CW or pulse operation. The design of a long wavelength laser, the Mark I SMASER (Submillimeter Amplification by Stimulation of Emitted Radiation) is discussed. SMASER devices are investigated as submillimeter generators to find if they can be shortened and operated with a continuous output. The experiments described establish that several gases will allow dc and pulsed submillimeter laser action with usable output powers. A new wavelength (220  $\mu$ ) has been found and is available for use. It seems likely that with more investigation, more wavelengths will be found, higher power will be obtained, and shorter SMASERS can be built. M. F.

**A66-29010****WATER VAPOR GAS LASER OPERATING AT 118-MICRONS WAVELENGTH.**

D. P. Akitt, W. Q. Jeffers, and P. D. Coleman (Illinois, University, Electro-Physics Laboratory, Urbana, Ill.).

IEEE, Proceedings, vol. 54, Apr. 1966, p. 547-551. 7 refs.

Grant No. AF AFOSR 804-65.

Experimental results on a water vapor gas laser operating at a wavelength of 118 microns are presented. A four-inch diameter, two-meter focal length mirror resonator system was used with a mirror spacing of 3.75 meters. Each half of the gas discharge was pulsed with a separate modulator capable of delivering up to eight kv at 300 amperes in a five- $\mu\text{s}$  pulse at repetition rates from 50 to 500 per sec. Data on laser output vs discharge current, gas pressure, cavity length, and time separation of modular pulses are given. Typical peak-power outputs at one mm Hg pressure and three amperes/ $\text{cm}^2$  current density were in excess of three milliwatts. Output coupling was achieved by means of a two-millimeter diameter hole in one resonator mirror. (Author)



**A66-29018**

## AN 81-GC/S ZERO-FIELD MASER.

W. E. Hughes and C. R. Kremenek (Westinghouse Electric Corp., Atomic, Defense and Space Group, Aerospace Div., Baltimore, Md.).

IEEE, Proceedings, vol. 54, Apr. 1966, p. 623-627. 11 refs. USAF-supported research.

A zero magnetic field millimeter maser is described which uses the iron ion  $\text{Fe}^{3+}$  in a host crystalline structure of rutile,  $\text{TiO}_2$ , as the active material. The maser operates as a classical three-level maser between three doubly degenerate zero-field spin levels of the iron ion at a frequency of 81.3 Gc and is pumped at a frequency of 124.5 Gc. Net gain in excess of 20 db with instantaneous bandwidths of 3-6 Mc have been obtained in a dielectric cavity type configuration. (Author)

**A66-29027**A NOTE ON THE SPIN-HAMILTONIAN OF  $\text{Fe}^{3+}:\text{TiO}_2$ .

Gero Schollmeier (Siemens und Halske AG, Zentrallaboratorium, Munich, West Germany).

IEEE, Proceedings, vol. 54, Apr. 1966, p. 680, 681.

Observation during experiments on  $\text{Fe}^{3+}:\text{TiO}_2$  of an obvious disagreement between theoretical values and measurements taken at a frequency of 3.92 Gc. The deviation was especially evident for the  $\pm 3/2$  transition at  $\theta = 90^\circ$ ,  $0 \leq \phi \leq 90^\circ$ . Although the theoretical values were derived only by a perturbation treatment described in a previous paper, the disagreement is too large to be attributed to this approximation. At least the dependence of the isofrequency line on  $\phi$  should be given more exactly. A check of the numerical calculation for the  $\pm 3/2$  transition showed that it would be sensitive to changes of the  $\pm (5/2)/\pm (3/2)$  elements in the spin Hamiltonian describing the paramagnetic behavior of the material. Improved agreement between theory and experiment was obtained by rotating the cubic term, thereby affecting only the off-diagonal elements. M. F.

**A66-29035**

## SURFACE TEMPERATURE OF LASER HEATED METAL.

Walter L. Knecht (USAF, Systems Command, Research and Technology Div., Avionics Laboratory, Wright-Patterson AFB, Ohio).

IEEE, Proceedings, vol. 54, Apr. 1966, p. 692, 693. 5 refs.

New technique for determining surface temperatures of laser-heated metals. This technique introduces the measurement of laser-induced ion emission from metals as a determinant of their surface temperatures. The procedure is simple in comparison to the conventional approach based on the classical heat-conduction equations. It can be applied to metals of many sizes and shapes, including miniature pellets. The surface temperatures of laser-heated metals are determined from their laser-induced ion currents; they agree satisfactorily with those derived from the classical heat-transfer theory. It is concluded that the new technique offers the advantage that the applicable material constants are known for many metals while, on the other hand, the material constants used in the heat-conduction equations may not yet be known in the wavelength range of present laser devices. M. F.

**A66-29051 #**

## LOW-NOISE AMPLIFICATION BY A MASER [RAUSCHARME VERSTÄRKUNG DURCH MASER].

R. Krönert.

Hochfrequenztechnik und Elektroakustik, vol. 75, Feb. 1966, p. 1-18. 21 refs. In German.

Examination of the relationship between amplification, bandwidth, and noise temperature in a maser amplifier, omitting a physical description of paramagnetic resonance. The theory of maser operation is reviewed and paramagnetic permeability and the Q-factor are considered. Two new techniques for measurement of noise are discussed. The polarization factor is analyzed and the nonreciprocal character of the amplification is demonstrated. Experimental results for low-noise maser amplifiers are given. D. P. F.

**A66-29057 #**

## POLISH-MADE LASER USING A GALLIUM ARSENIDE JUNCTION [KRAJOWY LASER ZŁĄCZOWY Z ARSENKU GALU].

B. Mrozwicz, J. Świdorski, and B. Darek (Polska Akademia Nauk, Instytut Podstawowych Problemów Techniki, Zakład Elektrotechniki, Warsaw, Poland).

Archiwum Elektrotechniki, vol. 15, no. 1, 1966, p. 163-167. 7 refs. In Polish.

Discussion of the design and principle parameters of a gallium arsenide laser using a p-n junction obtained by diffusion of zinc in a n-GaAs single crystal doped with tellurium in concentrations of up to  $1.8 \times 10^{18}$  atoms/cm<sup>3</sup>. Tests in which the laser was used to determine the material parameters of some semiconductors are described. V. P.

**A66-29115**

## EXPERIMENTAL EVIDENCE OF INVERSE BREMSSTRAHLUNG AND ELECTRON-IMPACT IONIZATION IN LOW-PRESSURE ARGON IONIZED BY A GIANT-PULSE LASER.

Che Jen Chen (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.).

Physical Review Letters, vol. 16, May 9, 1966, p. 833-835. 18 refs.

Discussion of experimental evidence showing that at low pressures (less than 1 atm) most of the electrons are produced after the cessation of the laser pulse, and the ionization rise time is increased as the pressure of the gas is decreased. It is also shown that the most probable mechanism for electron production is due to inverse bremsstrahlung and subsequent electron-impact ionization. M. M.

**A66-29117**

## QUANTUM THEORY OF AN OPTICAL MASER.

M. Scully and W. E. Lamb (Yale University, Dept. of Physics, New Haven, Conn.).

Physical Review Letters, vol. 16, May 9, 1966, p. 853-855. 10 refs. NASA-USAF-supported research.

Description of a quantum theory of laser behavior. To simplify the presentation, only single-mode oscillation is considered, and the effects of atomic motion and of spatial variation of the cavity mode are ignored. Combining the effects of interaction with the active and dissipative atoms, equations of motion are written for the laser radiation written in the Schrödinger picture. It is noted that, in the quantum theory, the process of contraction of the density matrix after the decay of each injected atom would convert even a pure case into a mixture, so that the derived equations really describe an ensemble of lasers for which phase information is gradually lost. The density matrix does not describe the laser but rather the state of knowledge of the ensemble of lasers under consideration. (Author)

**A66-29200 #**

## OPEN ASYMMETRICAL SPHERICAL RESONATORS FOR LASERS [OTKRYTYE NESIMMETRICHNYE SFERICHESKIE REZONATORY DLA LAZERA].

E. E. Fradkin.

(Vsesoiuznyi Simposium po Difraksii Voln, 3rd, Tiflis, Georgian SSR, Sept. 1963.)

Optika i Spektroskopiia, vol. 20, Feb. 1966, p. 316-323. 11 refs. In Russian.

Analysis of the symmetric properties of the integral equation of an open laser resonator composed of two ideally spherical mirrors with a rectangular aperture. Combinations of parameters are determined which have a bearing on frequencies and diffraction losses of such resonators, grouping resonators into those without diffraction losses and those with high diffraction losses. The resonance frequencies and the field distribution over the mirrors are found for the first type. V. Z.

**A66-29201 #**

## EFFECT OF RESONATOR CONFIGURATION ON LASER RADIATION OUTPUT [VLIYANIE KONFIGURATSII REZONATORA NA MOSHCHNOST' IZLUCHENIIA LAZERA].

V. N. Kuriatov and E. E. Fradkin.

*Optika i Spektroskopiia*, vol. 20, Feb. 1966, p. 324-326. 6 refs. In Russian.

Brief note on the results of an experimental study of the effect of resonator geometry and relative mirror positions on the radiation output of a He-Ne laser operating at  $1.15 \mu$ . The maximum radiation output vs mirror interspace is determined for resonators with a plane and a spherical mirror and with two spherical mirrors of radius 2.021 and 6.65 m and two identical spherical mirrors of radius 2.021 m. Factors are discussed, which may affect the radiation output when the interspace between the mirrors is increased; especially considered are the variations in the diffraction losses, in the generation-frequency spectrum, and in the spatial field distribution in the resonator interior. V. Z.

#### A66-29204 #

NONLINEAR QUENCHING OF RUBY LUMINESCENCE DURING ENHANCED EXCITATION [NELINEINOI TUSHENIE LUMINESTSENTSII RUBINA PRI POVYSHENNOM VOZBUZHDENII]. N. A. Tolstoi and A. P. Abramov.

*Optika i Spektroskopiia*, vol. 20, Feb. 1966, p. 345, 346. In Russian.

Brief note on the relation between nonlinear luminescence quenching and the concentration of luminescence centers (excited state density) in a laser crystal, determined from the luminescence output and relaxation. Powdered synthetic ruby doped with 2.5% Cr is used in the experiments to obtain a monomolecular rather than a semiconductor-type mechanism of luminescence. It is shown that this new type of quenching also occurs in activated crystals with low - i. e., "diluted" - concentrations of luminescence centers. V. Z.

#### A66-29209 #

VARIATION OF THE TEMPERATURE OF A MEDIUM UNDER THE ACTION OF A LASER PULSE [IZMENENIE TEMPERATURY SREDY POD DEISTVIEM LAZERNOGO IMPUL'SA]. V. N. Rudenko.

*Optika i Spektroskopiia*, vol. 20, Feb. 1966, p. 370, 371. In Russian.

Estimation of the thermal action of a coherent light beam in various media. The temperature distribution of a medium irradiated by a laser beam is found by solving the heat-conduction equation for a semibounded medium with distributed equivalent sources. Formulas are obtained for determining the maximum temperature of materials with good and poor conductivities. A. B. K.

#### A66-29210 #

SHADOW PROJECTIONS OF THE SPARK ARISING IN AIR DURING THE FOCUSING OF LASER EMISSION [TENEVYE PROEKTSII ISKRY V VOZDUKHE, VOZNIKAIUSHCHEI PRI FOKUSIROVANII IZLUCHENIIA LAZERA].

G. M. Malyshev, G. V. Ostrovskaya, and T. Ia. Chelidze. *Optika i Spektroskopiia*, vol. 20, Feb. 1966, p. 374, 375. In Russian.

Study of the shape and the dimensions of the spark arising during the focusing of laser emission, using the method of shadow projections. Shadow photographs of the spark are obtained for various delay times. Distinct bands surrounding the shadow from the plasma are observed and are used to calculate the longitudinal and transverse dimensions of the plasma. The plasma expansion rate during the first 100 nsec is found to be approximately  $10^6$  cm/sec. A. B. K.

#### A66-29348 #

THEORY OF A GAS LASER IN A MAGNETIC FIELD [K TEORII GAZOVOGO LAZERA V MAGNITNOM POLE]. M. I. D'iaconov and V. I. Perel'.

*Optika i Spektroskopiia*, vol. 20, Mar. 1966, p. 472-480. 16 refs. In Russian.

Calculation of the dipole moment of a gas, induced by the field of a standing electromagnetic wave in the presence of a magnetic field. The dependence of the dipole moment on the wave field is determined for arbitrary operating-level moments, with an accuracy

up to cubic terms. Steady-state solutions are obtained for the equations of a laser in longitudinal and transverse magnetic fields, and the stability of oscillations of various types is investigated. V. Z.

#### A66-29350 #

NONLINEAR LOSSES IN POWERFUL LASERS [O NELINEINYKH POTERIAX V MOSHCHNYKH LAZERAKH].

B. P. Kirsanov and A. S. Selivanenko.

*Optika i Spektroskopiia*, vol. 20, Mar. 1966, p. 490, 491. In Russian.

Brief discussion of losses in powerful lasers, due to (1) two-quanta absorption, and (2) induced anti-Stokes combination light scattering in the "working" energy levels of the crystal. An equation that describes the probability of occurrence of two-quanta absorption is analyzed. Losses related to the doubling of laser radiation power are the main point of discussion. V. Z.

#### A66-29352 #

REGENERATIVE OPTICAL HELIUM-NEON AMPLIFIER [REGENERATIVNYI OPTICHESKII KVANTOVYI USILITEL' NA SMESI GELIIA I NEONA].

V. V. Lebedeva, A. I. Odintsov, I. V. Lebedev, V. M. Andriakhin, E. S. Gudovich, and I. P. Ponomareva.

*Optika i Spektroskopiia*, vol. 20, Mar. 1966, p. 501-503. 6 refs. In Russian.

Experimental study of the performance of a regenerative laser that uses a helium-neon mixture and produces radiation at  $0.633 \mu$ . An equation for the amplification coefficient as a function of the laser parameters is derived. An amplification coefficient of 1000 is obtained in the experiments, and suggestions are given as to how the coefficient can be increased further. V. Z.

#### A66-29353 #

Q-FACTOR MODULATION OF A RUBY-LASER RESONATOR WITH THE AID OF TRANSPARENT SUBSTANCES OF THE PHTHALOCYANINE SERIES [MODULATSIIA DOBROTNOSTI REZONATORA RUBINOVOGO LAZERA S POMOSHCH'IU PROSVETLAIUSHCHIKHSIA VESHCHESTV RIADA FTALOTSIANINOV].

Iu. M. Griaznov, O. L. Lebedev, and A. A. Chastov.

*Optika i Spektroskopiia*, vol. 20, Mar. 1966, p. 503-505. 5 refs. In Russian.

Investigation of maximum laser power in the single-pulse mode as a function of the transmittance of various phthalocyanines. The results obtained with several promising solutions are plotted and discussed. V. P.

#### A66-29354 #

LASER Q-FACTOR MODULATION BY KC-19 FILTERS [MODULATSIIA DOBROTNOSTI LAZEROV FIL'TRAMI KS-19].

M. P. Lisitsa, N. R. Kulish, V. I. Geets, and P. N. Koval'.

*Optika i Spektroskopiia*, vol. 20, Mar. 1966, p. 508-510. 15 refs. In Russian.

Investigation aimed at increasing the peak power of coherent laser light by modulating the laser Q-factor by means of spectral absorption filters with inverse bleaching. The experiments were performed with a ruby laser using two multilayer dielectric mirrors as the resonator. Oscillograms are given of the output pulses obtained for various transmittance of the mirrors. Amplitudes of the peaks of output power are plotted as a function of mirror transmittance and pumping power. V. P.

#### A66-29356 #

SPECTRAL COMPOSITION OF EMISSION IN THE CASE OF NON-LINEAR OPTICAL EFFECTS [O SPEKTRAL'NOM SOSTAVE GENERATSII V SLUCHAE NELINEINYKH OPTICHESKIKH IAVLENI]. V. L. Strizhevskii.

*Optika i Spektroskopiia*, vol. 20, Mar. 1966, p. 516-519. 11 refs. In Russian.

Analysis of the spectral composition of laser light within the framework of the theory of nonlinear optical effects. The case in

which the exciting radiation penetrates into a medium with weakly nonlinear optical effects, results in the formation of harmonics and composites at the output, is examined. The electric and magnetic fields of the exciting radiation are treated in the form of Fourier series. V.P.

**A66-29357 #**

INVESTIGATION OF THE DEPENDENCE OF THE DISCHARGE PARAMETERS AND OUTPUT POWER OF AN He-Ne LASER ON THE DIAMETER OF A HOLLOW CATHODE [ISSLEDOVANIYA ZAVISIMOSTI PARAMETROV RAZRIADA I MOSHCHNOSTI GENE-RATSII He-Ne LAZERA OT DIAMETRA POLOGO KATODA]. V. B. Znamenskii, G. N. Buinov, and E. S. Bursakov. *Optika i Spektroskopiia*, vol. 20, Mar. 1966, p. 522-524. In Russian.

Experimental investigation of the relation between the laser parameters and cathode diameter in the excitation of a He-Ne mixture by the discharge of a hollow cathode. The discharge parameters that are optimum for laser power are determined, as are (1) the relation between the output power (for  $\lambda = 1.153$ ) and He pressure for various Ne partial pressures, (2) the relation between the output power and the density of the discharge current, and (3) the relation of the output power and the cathode diameter. V.P.

**A66-29358 #**

LASER USING A  $\text{CaF}_2\text{-Sm}^{2+}$  CRYSTAL FOR EXCITATION BY A RUBY LASER [OPTICHESKII GENERATOR NA KRISTALLE  $\text{CaF}_2\text{-Sm}^{2+}$  PRI VOZBUZHDENII RUBINOVYM LAZEROM]. V. K. Koniukhov, V. M. Marchenko, and A. M. Prokhorov. *Optika i Spektroskopiia*, vol. 20, Mar. 1966, p. 531, 532. 7 refs. In Russian.

Investigation of the excitation of a  $\text{CaF}_2\text{-Sm}^{2+}$  laser by a ruby laser at temperatures between 65 and 90°K. The coefficient of conversion of the absorbed energy into directional radiation energy is determined. V.P.

**A66-29384**

NITROGEN LASER ACTION IN A SUPERSONIC FLOW. J. Wilson (Avco Corp., Avco-Everett Research Laboratory, Everett, Mass.).

*Applied Physics Letters*, vol. 8, Apr. 1, 1966, p. 159-161. 5 refs.

Experimental study describing the operation of a pulsed nitrogen laser in a supersonic flow. The object of the work was to demonstrate that laser action is possible in a supersonic flow and that higher repetition rates are possible in such a flow than in static gas. An effective repetition rate of 13 kc was achieved and increased gain was observed when the gas was flowing. The experimental apparatus is described in which a pulsed nitrogen laser was built into a small supersonic wind tunnel. Nitrogen flowed at Mach 2 through the working section of the device. Experimental results show that laser action can be achieved in a supersonic flow and that interpulse times at least an order of magnitude less than diffusion time are attainable. M.L.

**A66-29385**

HYSTERESIS IN AN He-Ne LASER.

R. L. Fork, W. J. Tomlinson, and L. J. Heilos (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

*Applied Physics Letters*, vol. 8, Apr. 1, 1966, p. 162, 163. 6 refs.

Experimental study in which the existence of hysteresis phenomena was observed in a gaseous optical maser placed in an axial magnetic field. Evidence for hysteresis consists of the observation that the polarization of the oscillating mode within a certain tuning region depends on the polarization of the oscillation at the point being tuned into this region. It is suggested that this hysteresis or bistable phenomena implies the existence of "strong coupling" of modes in the optical maser. The experimental arrangement consisted of a short dc-excited (26-cm mirror spacing) internal mirror  $\text{He}^3\text{-Ne}^{20}$  optical maser operating at 1.52  $\mu$  on the  $2s_2\text{-}2p_1$  neon transition. Sample traces of mode intensities vs resonator tuning for various pressures, magnetic fields, and excitations are shown in three figures. M.L.

**A66-29387**

FREQUENCY LOCKING AND DYE SPECTRAL HOLE BURNING IN Q-SPOILED LASERS.

B. H. Soffer and B. B. McFarland (Korad Corp., Santa Monica, Calif.).

*Applied Physics Letters*, vol. 8, Apr. 1, 1966, p. 166-169. 8 refs. Contract No. Nonr-4130(00).

Experimental study presenting evidence in support of significant hole burning in bleachable absorbers used as Q spoilers in lasers. The study utilized the narrow spectral output of one passively Q-spoiled laser to bleach the passive cell of another laser. Identical spectral and temporal results were obtained with two different sets of experiments: (1) where the two lasers were set orthogonally with the output of one directed on the cell of the other, and (2) where the lasers were set orthogonally with crossed cavities and with a common passive Q-spoiling cell serving for both lasers at the intersection of the cavities near the mirrors of maximum reflectivity. It is concluded that hole burning in the dye, however rapid its spectral diffusion may be, is the cause of the frequency locking, and that the results supplement the mode competition or "natural selection of modes" theory of passively Q-spoiled lasers. M.L.

**A66-29388**

SELF MODE-LOCKING OF LASERS WITH SATURABLE ABSORBERS.

A. J. DeMaria, D. A. Stetser, and H. Heynau (United Aircraft Corp., Research Laboratories, East Hartford, Conn.).

*Applied Physics Letters*, vol. 8, Apr. 1, 1966, p. 174-176. 8 refs.

Experimental study reporting that saturable absorbers, such as reversible bleachable dye-solutions commonly used as laser Q-switches, are well suited as expander elements in the optical region if the dye's recovery time is shorter than the loop time-delay of the laser. Cutler's description of the operation of a micro-wave regenerative pulse generator is reviewed, and the fact that a laser has all the basic elements of Cutler's generator is pointed out. Simultaneous Q-switching and mode-locking experiments with saturable dyes were performed with 12.2-cm-long by 0.95-cm-diam and 76-cm-long by 1.9-cm-diam  $\text{Nd}^{3+}$ -doped glass rods. It is shown that the advantages of using a bleachable dye expander element arise from its ability to automatically obtain mode locking without having to critically adjust mirror spacing, modulating frequency, Q of the cavity, laser position, or compensate for any optical length perturbations of the feedback interferometer. M.L.

**A66-29390**

SPONTANEOUS AND COHERENT PHOTOLUMINESCENCE IN  $\text{Cd}_{1-x}\text{Hg}_x\text{Te}$ .

I. Melngailis and A. J. Strauss (Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.).

*Applied Physics Letters*, vol. 8, Apr. 1, 1966, p. 179, 180. 11 refs.

Experimental study reporting the observation of spontaneous emission at wavelengths from 3 to 15  $\mu$  and laser emission at 3.8 and 4.1  $\mu$  from  $\text{Cd}_{1-x}\text{Hg}_x\text{Te}$  crystals excited optically by the radiation from a GaAs diode laser. Emission spectra of such a laser ( $x \approx 0.32$ ) at 12°K, below and above the laser threshold, are shown. Spontaneous emission was obtained from  $\text{Cd}_{1-x}\text{Hg}_x\text{Te}$  samples with values of x between 0.18 and 0.37. A plot of the photon energy at the peak of the spontaneous emission line as a function of composition is presented, for samples at 12 and 77°K. It is concluded that the results strongly suggest that it will be possible to make such lasers for the efficient generation of infrared radiation at wavelengths appreciably beyond 8.5  $\mu$ , the maximum so far obtained from unstressed semiconductor lasers. M.L.

**A66-29391**

GENERATION OF ULTRASHORT OPTICAL PULSES BY MODE LOCKING THE YAlG: Nd LASER.

M. DiDomenico, Jr., J. E. Geusic, H. M. Marcos, and R. G. Smith (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

*Applied Physics Letters*, vol. 8, Apr. 1, 1966, p. 180-183. 9 refs.

Experimental and theoretical study in which the successful mode locking of the continuous (1.06- $\mu$ ) YAlG: Nd laser is reported

as well as the observation of optical pulses that are narrower than those previously reported. A schematic diagram of the experimental setup is given, in which the YAlG:Nd laser rod was continuously pumped at room temperature with a tungsten-iodine lamp. Reproductions of the power spectra the normal or unlocked laser and of the mode-locked laser are shown, in which the amplitudes of the oscillating modes were essentially equal, suggesting that the laser was mode locked over a frequency width of order 12.6 Gc (42 x 300 Mc). It is concluded that the effective number of modes coupled was 39, and that the effective pulse width of the mode-locked YAlG:Nd laser is  $8 \times 10^{-11}$  sec. Such a laser could form the basis of a possible  $10^4$  megabits/sec PCM communication system. M. L.

**A66-29414 #**  
ALIGNMENT CHARACTERISTICS OF A ROOF PRISM OPTICAL MASER.

Norio Karube, Yasuhide Sakai, and Eiso Yamaka (Matsushita Research Institute Tokyo, Inc., Kawasaki, Japan). *Japanese Journal of Applied Physics*, vol. 5, Mar. 1966, p. 257, 258.

Experimental study reporting successful laser oscillation with a totally reflecting roof prism as a cavity. The cavity consists of a totally reflecting quartz roof prism attached to one end of a quartz discharge tube (210 cm long, 0.8 cm ID) at the Brewster angle and an external plane mirror located 225 cm from the apex of the prism. The experimental arrangement is illustrated. The laser output vs mirror alignment for two rotation axes is plotted. Alignment characteristics are detailed. M. L.

**A66-29415 #**  
LASER OPERATION IN A WEDGE SHAPED RUBY.

Takao Tanaka, Chuhei Suzuki, Takasuke Fukui, and Kakuo Futami (KDD Research Laboratory, Tokyo, Japan). *Japanese Journal of Applied Physics*, vol. 5, Mar. 1966, p. 258, 259.

Observation of pulsed laser operation in a wedge-shaped ruby rod at room temperature. The rods used in the experiments were 50 mm long, 10 mm high, and had a nominal concentration of  $\text{Cr}_2\text{O}_3$  of 0.05%. The two rods studied had wedge angles of  $20^\circ$  and  $10^\circ$ . Photographs show the typical output and the near- and far-field patterns of the  $20^\circ$  rod. Stable oscillations in such rods seem to come from simple transverse mode oscillations which can be attained by focusing the pumping light into the narrow portion of the rod. M. L.

**A66-29640**

BROADENING OF NEON LEVELS UNDER THE EFFECT OF LASER RADIATION [ELARGISSEMENT DE NIVEAUX DU NEON SOUS L'INFLUENCE D'UN RAYONNEMENT LASER]. Bernard Decomps and Michel Dumont (Paris, Université, Ecole Normale Supérieure, Laboratoire de Spectroscopie Hertzienne, Paris, France).

*Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques*, vol. 262, no. 15, Apr. 13, 1966, p. 1004-1007. In French.

Determination of the natural width of  $3s^2$ ,  $2s^4$ , and  $3p^4$  levels of neon by observing the Hanle effect on fluorescent light emitted by atoms excited by a laser beam. A description is given of an experimental arrangement, including a laser, a radiation absorption tube containing methane gas, and an axial magnetic field, for independently varying the radiation characteristics and the parameters of the atomic medium when investigating the interaction of an electromagnetic atom-field excited by laser light. Polarized optical excitation gives rise to certain nondiagonal components in the matrix density of the upper and lower levels of the laser transition. In the presence of a magnetic field these components develop at twice the Larmor frequency. The broadening due to the Hanle effect on the  $3s^2$  level measured with  $6328 \text{ Å}$  high-intensity laser light is  $10 \pm 0.5 \text{ Mc}$ . D. P. F.

**A66-29682**

DETECTION OF WEAK MICROWAVE MODULATION OF LIGHT. H. Pursey, Patricia A. Merran, and B. Trevelyan (Ministry of Technology, National Physical Laboratory, Div. of Molecular Science, Teddington, Middx., England). *Nature*, vol. 210, Apr. 30, 1966, p. 511, 512. 7 refs.

Description of a method for the detection of very low levels of modulation on a laser beam for the purpose of determining the performance of microwave light modulators. The system may be used for either the detection of modulation, or if used with a Fabry-Pérot interferometer, to demonstrate the existence of optical sidebands as discrete frequencies. The principle of operation is that the adjacent sidebands emerging from an optical modulator have a different plane of polarization from that of the carrier wave. The modulator consists of a crystal of KDP in a rectangular TE 011 cavity fed from a 5-watt continuous X-band source. A laser beam passing along the optical axis of the crystal is weakly modulated at the microwave frequency. To display the weak optical modulation, with a depth of only 1%, audio-frequency modulation is imposed on the microwave beam and amplified. D. P. F.

**A66-29701**

MEASUREMENT OF THE ENERGY OUTPUT OF A LASER.

A. A. Besshaposhnikov, A. E. Voloshin, and I. Kh. Kuchuberia (Gosudarstvennyi Komitet Atomnoi Energii, Fiziko-Tekhnicheskii Institut, Sukhumi, Georgian SSR).

(*Priboiy i Tekhnika Eksperimenta*, vol. 10, Sept.-Oct. 1965, p. 204-206.)

*Instruments and Experimental Techniques*, Sept.-Oct. 1965, p. 1233-1235. 10 refs. Translation.

[For abstract see issue 04, page 520, Accession no. A66-13888]

**A66-29702**

INVESTIGATION OF TIME CHARACTERISTICS IN THE GENERATION OF GIANT PULSES BY A LASER.

V. L. Broude, V. I. Kravchenko, and M. S. Soskin (Akademiia Nauk Ukrainskoi SSR, Institut Fiziki, Kiev, Ukrainian SSR). (*Priboiy i Tekhnika Eksperimenta*, vol. 10, Sept.-Oct. 1965, p. 207-210.)

*Instruments and Experimental Techniques*, Sept.-Oct. 1965, p. 1236-1239. Translation.

[For abstract see issue 04, page 530, Accession no. A66-13889]

**A66-29703**

OPTICAL RESONATOR USING CYLINDRICAL MIRRORS WITH ADJUSTABLE RADIUS OF CURVATURE.

V. M. Klement'ev and Iu. D. Kolomnikov (Akademiia Nauk SSSR, Sibirskoe Otdelenie, Institut Fiziki Poluprovodnikov, Novosibirsk, USSR).

(*Priboiy i Tekhnika Eksperimenta*, vol. 10, Sept.-Oct. 1965, p. 210, 211.)

*Instruments and Experimental Techniques*, Sept.-Oct. 1965, p. 1240, 1241. Translation.

[For abstract see issue 04, page 530, Accession no. A66-13890]

**A66-29704**

MEASUREMENT OF A RELAXATION TIME OF  $\sim 10^{-9}$  SEC OF RECOMBINATION RADIATION OF A SEMICONDUCTOR SOURCE.

A. A. Zborovskii, Iu. A. Skomorovskii, and V. P. Sushkov. (*Priboiy i Tekhnika Eksperimenta*, vol. 10, Sept.-Oct. 1965, p. 224-227.)

*Instruments and Experimental Techniques*, Sept.-Oct. 1965, p. 1256-1259. Translation.

[For abstract see issue 04, page 563, Accession no. A66-13891]

**A66-29717**

IMPROVEMENT OF FREQUENCY STABILITY AND SPECTRAL PURITY OF P-N JUNCTION LASER BEAMS.

A. N. Chakravarti (Calcutta, University, University College of Technology, Institute of Radio Physics and Electronics, Calcutta, India).

*Indian Journal of Pure and Applied Physics*, vol. 4, Feb. 1966, p. 81-83. 8 refs.

The frequency stability and the spectral purity of the output of a p-n junction laser are shown to be much improved by synchronizing it with a gas laser beam. An experimental model for synchronization is proposed and a value of 0.1 mw of the He-Ne gas laser for the optimum synchronizing power is indicated. Optical isolation between gas and junction lasers does not present any difficult problem in view of the large difference in the Q values and in the divergence of the two laser beams. (Author)

#### A66-29725

FEATURES OF THE TIME BEHAVIOR OF THE GENERATION IN A LASER WITH MOVING RUBY CRYSTAL.

B. L. Livshitz, V. P. Nazarov, L. K. Sidorenko, A. T. Tursunov, and V. N. Tsikunov (Akademiia Nauk SSSR, Institut Obshchei i Neorganicheskoi Khimii, Moscow, USSR).

(ZHETF Pis'ma v Redaktsiiu, vol. 3, Apr. 1, 1966, p. 279-281.) *JETP Letters*, vol. 3, Apr. 1, 1966, p. 179-181. Translation.

Investigation of the influence of crystal motion on the time behavior of a laser generation mode, using high-speed photography partially supplemented with oscillograms pertaining to the start of generation. All measurements were made at room temperature.

It was observed first that in a wide range of above-threshold pumping, even at speeds  $v \sim 40$  cm/sec, a sharp increase takes place in the frequency of the lasing spikes, until they merge into continuous regions which are short compared with the generation duration. Further increase in the speed, at  $\sim 1.1$  of threshold pump, resulted in a gradual expansion of the continuous regions. At speeds  $v \sim 80$  cm/sec the generation becomes continuous in a number of cases practically from start to end, but the intensity oscillations still disclose traces of the spike regime. Detailed investigations of the conditions necessary to ensure continuous generation in a laser with moving crystal should make it possible in the future to, on the one hand, formulate the principles of continuous operation of a solid-state laser with a moving crystal, and, on the other, explain the spike character of the generation of most contemporary solid-state lasers. M.F.

#### A66-29727

DYNAMICS OF THE FIELD AND GENERATION FREQUENCY IN A GIANT PULSE OF A LASER WITH PASSIVE SHUTTER.

V. V. Korobkin, A. M. Leontovich, M. N. Popova, and M. Ia. Shchelev (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(ZHETF Pis'ma v Redaktsiiu, vol. 3, Apr. 1, 1966, p. 301-303.) *JETP Letters*, vol. 3, Apr. 1, 1966, p. 194-196. Translation.

Investigation of the dynamics of the field and of the generation frequencies in the giant pulse of a ruby laser with passive shutter. The passive shutter used was a cell with a solution of cryptocyanine in ethanol. The laser action, initiated on the end face and on a mirror having a reflection coefficient of 30%, bleached the cryptocyanine solution and a giant pulse developed. The pulse energy was 0.5-0.8 joule and the duration was 12-15 nsec at the half-power level. A photograph of the scanned generation field on the end of the crystal is shown. The initial generation period, when only the small central region of the crystal is in operation, ranges from 1 to 8 nsec on different photographs. In each individual small region, a pulse of duration 1.8-4 nsec is observed. The development of the generation field in the far zone is shown. At the start of the generation the divergence is  $1.2-1.5^\circ$  and increases subsequently to  $20^\circ$ . The observed change in the generation field of the giant pulse of a laser with passive shutter is in good qualitative agreement with the results of Suchkov and Letokhov. M.F.

#### A66-29812

EFFECTS OF COLLISIONS ON SATURATION BEHAVIOR OF THE

1.15- $\mu$  TRANSITION OF Ne STUDIED WITH He-Ne LASER.

A. Szöke and A. Javan (Massachusetts Institute of Technology, Dept. of Physics, Cambridge, Mass.).

*Physical Review, 2nd Series*, vol. 145, May 6, 1966, p. 137-147. 11 refs.

NASA-USAF-supported research.

The frequency response of the output power of a single-mode He-Ne gas laser has been studied in detail. This has been done in order to obtain information on the effects of atomic collisions on the frequency response of the individual atoms. At the operating pressures, the collision widths were considerably smaller than the Doppler width. From these measurements we find that in addition to pressure-dependent broadening due to hard collisions, there exists appreciable broadening due to soft collisions. Furthermore, we find the atomic collisions lead to an asymmetry in the average frequency response of individual atoms. It is shown that this slight asymmetry of the atomic response leads to a sizable shift of the frequency of the minimum of the Lamb dip where the effect of saturation is maximum. This shift has been obtained and is found to be pressure dependent. (Author)

#### A66-29813

EFFECTS OF TRANSVERSE AND AXIAL MAGNETIC FIELDS ON GASEOUS LASERS.

W. Culshaw and J. Kannelaud (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Research Laboratories, Palo Alto, Calif.). *Physical Review, 2nd Series*, vol. 145, May 6, 1966, p. 257-267. 11 refs.

Research supported by the Lockheed Independent Research Program.

The effects of transverse magnetic fields on a  $J = 1 - 0$  laser transition are considered, and expressions for the macroscopic-atomic-polarization terms are derived. The contributions from the  $\sigma$  modes are combined, and equations for the intensities and frequencies of the  $\pi$  and  $\sigma$  oscillations are deduced. Various coupling terms occur because of the common lower level of the transition, and a quenching of the initial  $\pi$ -mode oscillation with a change to the  $\sigma$  mode is indicated as the magnetic field increases from zero. With increased field, both modes oscillate simultaneously, and a beat occurs whose frequency depends on the operating conditions, and which may become zero again at higher magnetic fields. At line center the beat frequency should remain zero with increasing magnetic field, representing a method of laser tuning. Similar equations for the circularly polarized  $\sigma$  oscillations in axial magnetic fields are deduced. Here the conditions for stable two-frequency operation are more readily satisfied, and no such quenching is indicated. Again there are zero-beat-frequency regions of magnetic field in which a mutual synchronization of the oscillations should occur. Some experimental results with transverse magnetic fields on the 1.153- $\mu$  He-Ne laser are given. These display the general features indicated by the theory. Thus a quenching of the initial  $\pi$ -mode oscillation occurs, with more or less abrupt changes to the  $\sigma$ -mode, depending on conditions. Similar single-beat-frequency variations with magnetic field occur, together with a region near the line center where the beat frequency, although finite, remains constant with increasing magnetic field. (Author)

#### A66-29815

FLUCTUATION MEASUREMENTS IN MIXED LIGHT FIELDS.

W. Martienssen and E. Spiller (Frankfurt, Universität, Physikalisches Institut, Frankfurt am Main, West Germany). *Physical Review, 2nd Series*, vol. 145, May 6, 1966, p. 285-287. 13 refs.

The statistical properties of light fields which are generated by superposition of laser light and chaotic light are investigated experimentally. The chaotic field is produced by scattering a laser beam at a moving ground-glass screen. The probability densities for the light intensity and their variances are measured and found to be in agreement with theory. (Author)

#### A66-29816

SECOND-HARMONIC GENERATION OF LIGHT BY FOCUSED LASER BEAMS.

D. A. Kleinman, A. Ashkin, and G. D. Boyd (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).  
Physical Review, 2nd Series, vol. 145, May 6, 1966, p. 338-379. 18 refs.

Experimental and theoretical study on second-harmonic generation (SHG) by focused laser beams in nonlinear crystals which are large compared with the extent of the focus. The gas-laser beam is in the lowest mode (Gaussian) and closely approximates index-matching conditions in the crystal. The SHG intensity pattern as observed photographically has roughly the shape of a half-moon with a very sharp edge. The nature and pattern of the fine structure is described. The power was measured as a function of crystal orientation, and the position of the edge was determined for the orientation giving maximum power. An exact formula is given for the second-harmonic field for the case in which the laser beam is in a Gaussian mode. This formula is decomposed into three types of terms with varying distance dependence. A parameter to define the phase-matching conditions is derived. D.P.F.

#### A66-29879

USE OF LASER RADIATION TO CREATE A STRONG ELECTRON SOURCE.

O. V. Bogdankevich, V. Iu. Sudzilovskii, and A. A. Lozhnikov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).  
(Zhurnal Tekhnicheskoi Fiziki, vol. 35, Nov. 1965, p. 2052, 2053.)  
Soviet Physics - Technical Physics, vol. 10, May 1966, p. 1573, 1574. Translation.

[For abstract see issue 06, page 889, Accession no. A66-16149]

#### A66-29885

THEORY OF COUPLED OPTICAL MASERS.

E. M. Belenov and V. S. Letokhov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).  
(Zhurnal Tekhnicheskoi Fiziki, vol. 35, Nov. 1965, p. 2126-2128.)  
Soviet Physics - Technical Physics, vol. 10, May 1966, p. 1628, 1629. Translation.

Results of an investigation of synchronization of two lasers, in a formulation more general than those previously reported, with various field amplitudes and delayed interaction, and allowing for coupling of the lasers through the active medium as well as through the resonators. The dispersion of the dielectric constant is taken into account. R.A.F.

#### A66-29980

PROPAGATION VELOCITY OF AN INTENSE LIGHT PULSE IN A MEDIUM WITH INVERTED POPULATION.

N. G. Basov, R. V. Ambartsumian, V. S. Zuev, P. G. Kriukov, and V. S. Letokhov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).  
(Akademiia Nauk SSSR, Doklady, vol. 165, Nov. 1, 1965, p. 58-60.)  
Soviet Physics - Doklady, vol. 10, May 1966, p. 1039, 1040. Translation.

[For abstract see issue 05, page 717, Accession no. A66-15333]

#### A66-29988

ON THE SPECTRUM WIDTH OF LASER RADIATION.

Iu. A. Tarasov.  
(Akademiia Nauk SSSR, Doklady, vol. 165, Nov. 21, 1965, p. 537-540.)  
Soviet Physics - Doklady, vol. 10, May 1966, p. 1088-1090. 7 refs. Translation.

[For abstract see issue 06, page 891, Accession no. A66-16541]

#### A66-29989

HEATING OF THIN SHEETS IN LASER WELDING.

N. N. Rykalin and A. A. Uglov (Akademiia Nauk SSSR, Institut Metallurgii, Moscow, USSR).  
(Akademiia Nauk SSSR, Doklady, vol. 165, Nov. 11, 1965, p. 319-322.)  
Soviet Physics - Doklady, vol. 10, May 1966, p. 1106-1108. Translation.

[For abstract see issue 05, page 688, Accession no. A66-15347]

#### A66-29998 #

SATELLITE RANGE MEASUREMENTS WITH A LASER AT AN ASTROPHYSICAL OBSERVING STATION.

C. G. Lehr, L. A. Maestre, and P. H. Anderson (Smithsonian Institution, Smithsonian Astrophysical Observatory, Cambridge, Mass.).

COSPAR, International Space Science Symposium, 7th, Vienna, Austria, May 10-19, 1966, Paper, 25 p. 12 refs.

Grant No. NSG-87-60.

A number of range measurements were made from Smithsonian's astrophysical observing station at Organ Pass, N.Mex., to Explorers 22, 27, and 29. The measurements were made with a laser transmitter and photoelectric receiver nearly collocated with the Baker-Nunn camera. The results are being compared to ranges derived from orbits based on the observations of the network of Baker-Nunn cameras to determine if the new range observations will strengthen the computation of satellite orbits. The results are also being used to compare the actual performance of the laser system with the performance predicted by the radar-range equation. A ruby laser, operating at 6943 Å, was used as the transmitter. Its energy output was 0.5 joule with a pulse width of less than 100 nsec. The beamwidth was 1 mrad. The satellite was tracked visually with telescopes attached to the laser mount. The receiver consisted of a modified searchlight 1.5 m in diameter with an effective area of 0.18 m<sup>2</sup>. The detector was a photomultiplier. Range measurements were made by timing the two-way travel of the laser beam between transmitter and satellite to ±10 nsec (equivalent to ±1.5 m). (Author)

#### A66-30127

HIGH-ORDER FLUCTUATIONS IN A SINGLE-MODE LASER FIELD.

F. T. Arecchi (Centro Informazioni Studi Esperienze, Laboratori; Milano, Università, Istituto di Fisica, Milan, Italy), A. Berné (Centro Informazioni Studi Esperienze, Laboratori, Milan, Italy), and P. Bulmacchi (Centro di Studio per la Fisica delle Microonde, Florence, Italy).

Physical Review Letters, vol. 16, Jan. 3, 1966, p. 32-35. 15 refs. Research supported by the Italian National Research Council.

Investigation of the statistical nature of a single-mode laser field. Experimental evidence is given of the accuracy of a model of a single-mode laser field consisting of an amplitude-stabilized sine wave with a slowly varying random phase plus a stationary noise field. The field-correlation measurements are pushed two orders further than in previous studies of ordinary intensity fluctuations. A.B.K.

#### A66-30139

COLLECTIVE SCATTERING OF LASER LIGHT BY A PLASMA.

P. W. Chan and R. A. Nodwell (British Columbia, University, Dept. of Physics, Vancouver, Canada).  
Physical Review Letters, vol. 16, Jan. 24, 1966, p. 122-124. 8 refs.

Research supported by the Atomic Energy Control Board of Canada.

Observation of the scattering of light from a pulsed ruby laser by a plasma jet. The profile of the scattered light shows unambiguously the distinct satellite peaks on both sides of the central frequency, indicating strong collective effects between the ions and electrons. B.B.

#### A66-30153

OBSERVATION OF COOPERATIVE EFFECTS IN THE SCATTERING OF A LASER BEAM FROM A PLASMA.

S. A. Ramsden and W. E. R. Davies (National Research Council, Div. of Pure Physics, Ottawa, Canada).  
Physical Review Letters, vol. 16, Feb. 21, 1966, p. 303-306. 14 refs.

Observation of cooperative interactions between ions and electrons in the forward scattering of a ruby-laser beam from a plasma. Measurements which show both the ion peak and the satellites and which correspond to the results expected for a plasma in which the electrons have a thermal-velocity distribution are reported. A.B.K.

**A66-30157**

LENGTH-DEPENDENT THRESHOLD FOR STIMULATED RAMAN EFFECT AND SELF-FOCUSING OF LASER BEAMS IN LIQUIDS. Charles C. Wang (Ford Motor Co., Scientific Laboratory, Physical Electronics Dept., Blue Bell, Pa.).

*Physical Review Letters*, vol. 16, Feb. 28, 1966, p. 344-346. 14 refs.

Discussion of length-dependent threshold data for stimulated Raman emission in several liquids (benzene, toluene, and nitrobenzene). It is shown that the data obtained can be interpreted in terms of a predicted dependence of the onset of Raman emission on the threshold distance required for self-focusing to develop. By extrapolating the results to liquid cells of infinite length, values of critical power for self-trapping of a laser beam in liquids are obtained.

A. B. K.

**A66-30176**

ISOTOPE SHIFTS AND THE ROLE OF FERMI RESONANCE IN THE CO<sub>2</sub> INFRARED MASER.

Irwin Wieder and Gregor B. McCurdy (Interphase Corporation-West, Palo Alto, Calif.).

*Physical Review Letters*, vol. 16, Mar. 28, 1966, p. 565-567. 14 refs.

Research supported by Interphase Corporation-West; USAF, and the Socony Mobil Oil Co.

Observation of laser action in several P transitions of the 00<sup>0</sup>-10<sup>0</sup> and 00<sup>0</sup>1-02<sup>0</sup>0 bands of C<sup>12</sup>O<sub>2</sub><sup>18</sup>. The contribution of Fermi resonance to the large observed isotope shift and to the kinetics of the laser is considered.

R. A. F.

**A66-30181**

SPONTANEOUS-EMISSION LINE SHAPE OF ION LASER TRANSITIONS.

W. R. Bennett, Jr., E. A. Ballik, and G. N. Mercer (Yale University, Dunham Laboratory, New Haven, Conn.).

*Physical Review Letters*, vol. 16, Apr. 4, 1966, p. 603-605. 11 refs.

USAF-Army-supported research.

Description of a classical derivation of the actual line shape to be expected from an accelerating, radiating ion, and evaluation of the errors associated with a Lorentzian approximation to this shape. Experimental results on representative ion laser transitions in argon for which accurate radiative lifetime data are available are presented. These results show that the Lorentzian approximation is extremely good for typical conditions in the Ar<sup>+</sup> laser, due largely to very important nonradiative sources of phase interruption. The most plausible source of this additional line broadening consists of small-angle Coulomb scattering in ion-ion collisions.

M. M.

**A66-30182**

OPTICAL HARMONIC GENERATION IN THE INFRARED USING A CO<sub>2</sub> LASER.

C. K. N. Patel (Bell Telephone Laboratories, Inc., Murray Hill, N. J.).

*Physical Review Letters*, vol. 16, Apr. 4, 1966, p. 613-616. 17 refs.

Discussion of optical harmonic generation in the IR (with a CO<sub>2</sub> laser) in the following: (1) zinc blende crystals (43 m) InAs, GaAs, ZnS, CdTe, ZnSe, and ZnTe; (2) hexagonal crystals (6 mm) ZnS, CdS, and CdSe; and (3) a trigonal crystal (32), Se. The results obtained on 6 mm crystals ZnS, CdS, and CdSe are tabulated. The accuracy of the nonlinear coefficient measurement for selenium is poor (possible error ~50%) because large single-crystal samples of Se are difficult to obtain.

M. M.

**A66-30187**

RELATIVISTIC CORRECTIONS FOR TERRESTRIAL CLOCK SYNCHRONIZATION.

W. J. Cocke (Aerospace Corp., El Segundo, Calif.).

*Physical Review Letters*, vol. 16, Apr. 11, 1966, p. 662-664. 8 refs.

Contract No. AF 04(695)-669.

Examination of a case in which atomic maser clocks are rotating with the earth, and derivation of a formula for the relative drifts of clocks at widely separated localities. Using an approximate treatment based on the principle of equivalence, it is shown that clocks fixed on the geodetic "geoid" surface do not drift relative to each other; the geoid is defined as that surface which is everywhere perpendicular to a local plumb line and which at the seashore coincides with mean sea level. Clocks stable to within  $5 \times 10^{-13}$  are being currently used and long-distance time synchronization to within 1  $\mu$ sec is now attainable.

M. M.

**A66-30205 #**

A METHOD OF PRODUCING AN UNMODULATED LASER OUTPUT AT A CONTROLLED FREQUENCY.

D. C. Wilson and W. R. C. Rowley (Ministry of Technology, National Physical Laboratory, Standards Div., Teddington, Middx., England). *Journal of Scientific Instruments*, vol. 43, May 1966, p. 314-316.

Description of a system which permits the wavelength of a helium-neon laser to be controlled at any value within the available bandwidth. A second laser, used as a reference, has its wavelength controlled at a specific value - e.g., the peak of the intensity profile - and beats between the two radiations are used to generate a correcting signal for the first laser. The resulting wavelength-stabilized output is free of modulation and can be used for long-distance interferometry.

M. F.

**A66-30278 #**

A NEW LASER LINE DUE TO ENERGY TRANSFER FROM COLOUR CENTRES TO ERBIUM IONS IN CaF<sub>2</sub>.

P. A. Forrester and D. F. Sampson (Ministry of Aviation, Royal Radar Establishment, Great Malvern, Worcs., England).

*Physical Society, Proceedings*, vol. 88, May 1966, p. 199-204. 13 refs.

Two new laser lines at 1.5308  $\mu$  and 1.5298  $\mu$  have been observed in single crystals of CaF<sub>2</sub> grown from a melt containing Er<sub>2</sub>O<sub>3</sub>. The stimulated emission from such crystals is different from those doped with ErF<sub>3</sub>, presumably reflecting a difference in the crystalline environment at the site of the impurity ions. The emission only occurs in crystals which have been  $\gamma$ -irradiated; this treatment produces strong absorption bands centred on 3620 Å and 5520 Å, which arise from a color center associated with the presence of oxygen in the lattice. Absorption in these bands produces excitation which is transferred to the erbium impurity ions, resulting in an enhancement of the fluorescence power. The lines have lower thresholds than previously reported emissions from erbium, but only occur at temperatures in the liquid helium region. The output power shows a saturation effect which is attributed to a rise in the temperature of the lattice during the pumping pulse.

(Author)

**A66-30281**

INTERACTION OF TRAVELING WAVES IN A RING LASER.

E. M. Belenov, E. P. Markin, V. N. Morozov, and A. N. Oraevskii (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR). (ZHETF Pis'ma v Redaktsiiu, vol. 3, Jan. 1, 1966, p. 54-58.)

*JETP Letters*, vol. 3, Jan. 1, 1966, p. 32-35. 5 refs. Translation. [For abstract see issue 13, category 16, Accession no. A66-25102]

**A66-30282**

FREQUENCY SHIFT OF OPTICAL TRANSITION IN THE FIELD OF A LIGHT WAVE.

E. B. Aleksandrov, A. M. Bonch-Bruевич, N. N. Kostin, and V. A. Khodovoi (Gosudarstvennyi Opticheskii Institut, Leningrad, USSR). (ZHETF Pis'ma v Redaktsiiu, vol. 3, Jan. 15, 1966, p. 85-88.)

*JETP Letters*, vol. 3, Jan. 15, 1966, p. 53-55. Translation. [For abstract see issue 13, category 16, Accession no. A66-25103]

**A66-30291**

MEASUREMENT OF THE DISTANCE TO THE MOON BY OPTICAL RADAR.

Iu. L. Kokurin, V. V. Kurbasov, V. F. Lobanov, V. M. Mozhzherin, A. N. Sukhanovskii, and N. S. Chernykh (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR). (ZHETF Pis'ma v Redaktsiiu, vol. 3, Mar. 1, 1966, p. 219-223.) JETP Letters, vol. 3, Mar. 1, 1966, p. 139-141. Translation.

Description of an experimental setup for measuring the distance from earth to the lunar surface by an optical radar. The transmitting and receiving setup includes a ruby laser and a photomultiplier mounted in a fixed position at the Coudé focus of a telescope to receive light signals reflected from the lunar surface. The parameters and technical specifications of the setup are given. The results of measurements are diagramed. V. Z.

#### A66-30297

##### LASER WITH NONRESONANT FEEDBACK.

R. V. Ambartsumian, N. G. Basov, P. G. Kriukov, and V. S. Letokhov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR). (ZHETF Pis'ma v Redaktsiiu, vol. 3, Mar. 15, 1966, p. 261-264.)

#### A66-30419

##### TECHNIQUE FOR STREAK CAMERA WRITING RATE CALIBRATION USING PULSED LASER.

A. B. Christensen and W. M. Isbell (Stanford Research Institute, Poulter Research Laboratories, Menlo Park, Calif.). Review of Scientific Instruments, vol. 37, May 1966, p. 559-561.

Method with which the writing rate of a rotating-mirror streak camera can be determined by using a Q-switched laser. The laser beam is split with a partially reflecting mirror so that the path length of one portion from the laser to the film is shorter than that of the other. The separation on the film of the two laser events, the velocity of light, the difference in the beam-path lengths, and the orientation of the mirror are used to determine the average writing rate as a function of mirror position and velocity. A concrete example is worked out. R. A. F.

#### A66-30586

##### DETERMINATION OF THE ORBIT OF THE GEOS-A SATELLITE BY LASER TELEMETRY FROM A STATION [DETERMINATION DE L'ORbite DU SATELLITE GEOS-A AU MOYEN D'UN TELEMETRE A LASER A PARTIR D'UNE STATION].

Robert Bivas and Nicole Morael-Courtois (Centre National de la Recherche Scientifique, Service d'Aéronomie, Verrières-le-Buisson, Seine-et-Oise, France).

Académie des Sciences (Paris), Comptes Rendus, Série A - Sciences Mathématiques, vol. 262, Apr. 18, 1966, p. 935-937.

#### A66-30594

##### LENSES GUIDE OPTICAL FREQUENCIES TO LOW-LOSS TRANSMISSION.

Georg Goubau (U.S. Army, Electronics Command, Electronics Laboratories, Fort Monmouth, N. J.).

Electronics, vol. 39, May 16, 1966, p. 83-89. 12 refs.

Discussion of future possibilities of utilizing laser light for long-distance communications. The advantages and drawbacks of an optical communications system with regard to a communications system employing microwaves are examined. Three types of waveguides (tubular, surface, and wave guides) are discussed, by means of which the optical beam can be guided and protected from air turbulence at low transmission loss. Several experimental optical beam waveguides are described and the results obtained with these are given. V. P.

#### A66-30616

##### DEMULATION OF PHASE-MODULATED LASER BEAM BY AUTOCORRELATION.

Shigebumi Saito and Tatsuya Kimura (Tokyo, University, Institute of Industrial Science, Tokyo, Japan).

Electronics and Communications in Japan, vol. 48, Mar. 1965, p. 45-51. 11 refs. Translation.

Research sponsored by the Nippon Telegraph and Telephone Public Corp.

Analysis and experimental results for a demodulation method in which phase modulation of light is converted to amplitude modulation by autocorrelation. The theory of the first-order approximation and the associated experiments are described. In the experimental work, a beam from the He-Ne gas laser is phase-modulated at 1860 Mc by a KDP modulator and is then autocorrelated using a Twyman interferometer and detected by a TWT with photocathode. The theory and experiments indicate satisfactory agreement. In addition, higher-order nonlinear terms and the characteristics of the multimode laser as well as of amplitude-modulated light are discussed. M. F.

#### A66-30628

##### NOTE ON RADIATIVE CORRECTIONS TO THOMSON SCATTERING IN INTENSE LASER BEAMS.

J. H. Eberly (Rochester, University, Dept. of Physics and Astronomy, Rochester, N. Y.).

Physics Letters, vol. 19, Nov. 1, 1965, p. 284, 285. 13 refs.

Grant No. DA-ARO(D)-31-124-G569.

Summary of the results of a quantum mechanical investigation of corrections to Thomson scattering arising from radiative damping in the motion of the electron and the extremely high density of photons present in the laser beam. It is concluded that, in extremely intense laser beams (such as are currently being used in free-electron scattering experiments), the corrections to the classical Thomson formula will be overwhelmingly of the external field type, whereas true radiative corrections will be unobservably small. R. A. F.

#### A66-30645

##### PHOTOELECTRON STATISTICS PRODUCED BY A LASER OPERATING BELOW THE THRESHOLD OF OSCILLATION.

Charles Freed (Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.) and Hermann A. Haus (Massachusetts Institute of Technology, Dept. of Electrical Engineering and Research Laboratory of Electronics, Cambridge, Mass.).

Physical Review Letters, vol. 15, Dec. 20, 1965, p. 943-946. 9 refs.

Contract No. DA-36-039-AMC-03200(E).

Experimental determination of the probability distribution of photoelectron counts produced by a narrow-band Gaussian light source. The source used in the experiment was an He-Ne gas laser operating at 6328 Å adjusted to operate slightly below threshold with a light bandwidth of about 380 cps. This is considered to be the first observation of a (nearly) Bose-Einstein probability distribution of photoelectrons, and the results furnish the first experimental verification of Glauber's theoretical expressions. R. A. F.

#### A66-30820 #

##### TEMPERATURE DEPENDENCE OF THE CHARACTERISTICS OF THE CROSS RELAXATION RUTILE MASER.

Risao Hayashi.

Radio Research Laboratories, Journal, vol. 12, Nov. 1965, p. 381-392.

Shifts of paramagnetic resonance spectra due to temperature change were observed in crystals of TiO<sub>2</sub> doped with Cr<sup>3+</sup>. The inversion ratio was examined as a function of the separation of crossing spectra and the deviation angle for the cross relaxation maser at different temperatures. The temperature dependence of the pumping power and the desirable orientation are discussed.

(Author)

#### A66-30828

##### HIGH-SPEED STROBOSCOPIC PHOTOGRAPHY USING A KERR-CELL MODULATED LASER SOURCE.

Antoni K. Oppenheim (California, University, Dept. of Aeronautical Sciences, Berkeley, Calif.), George J. Hecht, and Gerald B. Steel. ISA Transactions, vol. 5, Apr. 1966, p. 133-138. 7 refs.

Grant No. AF AFOSR 129-65.

In the study of high-speed transient phenomena, photographic techniques yielding high framing rates and short exposures become important tools of research. This paper describes a modern system for high-speed stroboscopic photography which utilizes a Kerr cell, Q-spoiled, modulated laser light source. The laser beam pro-



## A66-30845

vides a very satisfactory illuminator for high-speed direct-image, Schlieren, and interferometer photography. With the equipment described in this paper,  $10^{-8}$ -sec exposures may be taken with an interval between flashes of  $10^{-6}$  sec. (Author)

### A66-30845 #

METHOD OF KINETIC EQUATIONS IN THE THEORY OF GENERATION OF SECOND OPTICAL HARMONICS.

I. A. Marushko and V. S. Mashkevich.

(Optika i Spektroskopiia, vol. 20, Jan. 1966, p. 117-127.)

Optics and Spectroscopy, vol. 20, Jan. 1966, p. 61-66. 13 refs. Translation.

[For abstract see issue 10, page 1544, Accession no. A66-22026]

### A66-30846 #

MEASUREMENT OF THE METASTABLE LEVEL POPULATION OF THE WORKING SUBSTANCE OF A LASER.

A. P. Aleksandrov, V. N. Genkin, and M. I. Kheifets.

(Optika i Spektroskopiia, vol. 20, Jan. 1966, p. 133-137.)

Optics and Spectroscopy, vol. 20, Jan. 1966, p. 69-72. 6 refs. Translation.

[For abstract see issue 10, page 1544, Accession no. A66-22027]

### A66-30847 #

ON THE ANGULAR DISTRIBUTION OF ENERGY EMITTED BY A LASER.

V. M. Podgaetskii, O. G. Korneeva, and A. N. Chernets.

(Optika i Spektroskopiia, vol. 20, Jan. 1966, p. 138-142.)

Optics and Spectroscopy, vol. 20, Jan. 1966, p. 72-74. 8 refs. Translation.

[For abstract see issue 10, page 1544, Accession no. A66-22028]

### A66-30853 #

MONOCHROMATIZATION OF THE RADIATION OF A RUBY LASER WITH A COMPLEX RESONATOR.

S. M. Mamedzade.

(Optika i Spektroskopiia, vol. 20, Jan. 1966, p. 178-180.)

Optics and Spectroscopy, vol. 20, Jan. 1966, p. 96, 97. Translation.

[For abstract see issue 10, page 1544, Accession no. A66-22032]

### A66-30865 #

SEMICLASSICAL THEORY OF QUANTUM GENERATORS [K POLU-KLASSICHESKOI TEORII KVANTOVYKH GENERATOROV].

A. K. Popov (Akademiia Nauk SSSR, Sibirskoe Otdelenie, Institut Fiziki, Krasnoyarsk, USSR).

Fizika, vol. 9, no. 2, 1966, p. 16-24. 15 refs. In Russian.

Investigation of the peculiar features of the response of laser system to the effect of a monochromatic standing wave, on the basis of the kinetic equation for the density matrix. The steady mode of laser emission is examined on the basis of a simultaneous solution of the Maxwell equations and the density matrix equations. The non-uniformities of the field-modulated medium and the motion of the emitting particles are taken into account. The generation threshold and steady mode of gas-laser emission are compared to those of a solid-state laser. V.P.

### A66-30934 #

MASER PERFORMANCE VERSUS SPIN CONCENTRATION IN CHROMIUM-DOPED  $K_3Co(CN)_6$ .

Rolf Tengblad.

Arkiv för Fysik, vol. 30, no. 3, 1965, p. 203-215. 13 refs.

Research supported by the Swedish Technical Research Council, the Swedish Natural Science Research Council, and the Royal Society of Arts and Science of Gothenburg.

Determination of the inverted susceptibility, inversion ratios, linewidths and spin-lattice relaxation times for a maser operation point ( $f_{\text{signal}} = 450$  Mc,  $B_{DC} = 90$  gauss,  $B_{DC}$   $180^\circ$  from the c-axis in ac-plane) in chromium-doped  $K_3Co(CN)_6$ . The chromium ion

concentration was varied between 0.013 to 0.98%. The optimum chromium concentration is determined to be 0.2% at 4.2°K and 0.1% at 1.5°K. The decrease in the inversion ratios for higher chromium concentrations is explained in terms of spin-lattice relaxation. (Author)

### A66-30938 #

BREAKDOWN IN GASES BY 10600 Å LASER RADIATION.

Tore Bergqvist and Bengt Kleman (Research Institute of National Defence, Physics Dept., Stockholm, Sweden).

Arkiv för Fysik, vol. 31, no. 2, 1966, p. 177-189. 21 refs.

Breakdown by 10,600 Å Nd-glass laser radiation has been studied in a number of gases. The power densities required for breakdown have been determined for five atomic and eight molecular gases at a pressure slightly below 1 atm. The breakdown powers differ by a factor of about 5. High breakdown powers are shown by gases with a high ionization potential. Studies of the pressure dependence of the breakdown power were made for some of the gases. In the region 0.1-1 atm there is a steep decrease of the breakdown power with increasing pressure. This is particularly pronounced in Xe, in which the breakdown power from 0.5 atm upward has a low, only very slightly decreasing, value up to the highest pressure studied, 5 atm. A comparison with data for breakdown in gases by 6943 Å ruby laser radiation does not indicate any critical dependence of the breakdown power on the wavelength of the optical radiation. (Author)

### A66-31071

DISLOCATIONS AND PRECIPITATES IN GaAs INJECTION LASERS.

M. S. Abrahams and C. J. Buicchi (Radio Corporation of America, RCA Laboratories, Princeton, N.J.).

Journal of Applied Physics, vol. 37, Apr. 1966, p. 1973-1977. 11 refs.

Research supported by the Radio Corporation of America; ARPA Contract No. SD-182.

The new A-B etchant has been employed to reveal interfacial dislocations near the junctions of GaAs injection lasers. Injection lasers were examined parallel and perpendicular to the junction region. Dislocations are seen predominantly in the junction region, lying in the (001) plane, and in only two directions, the [110] and  $[\bar{1}\bar{1}0]$ . Their source is ascribed to the lattice mismatch between the substrate and grown layer. Decoration of the dislocations parallel to [110] is observed, but very little decoration of the  $[\bar{1}\bar{1}0]$  dislocations is seen. The decorating impurity is believed to be Zn. The difference in decoration of the [110] and  $[\bar{1}\bar{1}0]$  dislocations is accounted for by a difference in the structure of these two dislocations. A direct correlation between lasing filaments and decorated interfacial dislocations was found in the [110] direction. This is believed to be due to the local distortion of the current lines near the defects. (Author)

### A66-31077

GIANT PULSE SHORTENING BY RESONATOR TRANSIENTS.

Dieter Roess (Siemens und Halske AG, Central Laboratories, Munich, West Germany).

Journal of Applied Physics, vol. 37, Apr. 1966, p. 2004-2006. 5 refs.

Method for shortening giant pulses in a laser by using them to pump a secondary laser oscillator with suitable absorption bands. Results are given from a computer investigation of the transient behavior of a system so constructed. The rise time of the resulting pulses can be further shortened by amplification in a saturated amplifier which is also pumped by the primary (giant) pulse. Materials with high transition probability are best adapted to this method; ruby-YAG:Nd<sup>3+</sup> seems well suited. R.A.F.

### A66-31082

GROWTH OF LASER-QUALITY RARE-EARTH FLUORIDE SINGLE CRYSTALS IN A DYNAMIC HYDROGEN FLUORIDE ATMOSPHERE.

M. Robinson and D. M. Cripe (Hughes Aircraft Co., Research Laboratories, Malibu, Calif.).  
Journal of Applied Physics, vol. 37, Apr. 1966, p. 2072-2074. 8 refs.

Contract No. AF 33(615)-1999.

Technique for growing single crystals of rare-earth fluorides for laser use. The method is a modification of Stockbarger's technique (1949), with HF added to He to form the ambient gas. A commercially available graphite resistance furnace was used. Rare-earth oxides of the highest purity easily obtainable commercially were purified by means of an ion exchange method discussed by Powell (1961). The rare earth recovered from the exchange process was precipitated as the oxalate and calcined at 900°C to the oxide, which was then reacted with HF gas to form the fluoride. R.A.F.

#### A66-31084

LINEWIDTH AND SATURATION PARAMETERS FOR THE 6328-Å TRANSITION IN A He-Ne LASER.

P. W. Smith (Bell Telephone Laboratories, Inc., Crawford Hill Laboratory, Holmdel, N.J.).  
Journal of Applied Physics, vol. 37, Apr. 1966, p. 2089-2093. 17 refs.

Experimental measurements of the collision-broadened linewidth and saturation parameters for the 6328-Å transition of Ne in a He-Ne laser are reported as a function of total gas pressure in the laser tube. The measurements are made from observations of the single-mode output power of a laser as a function of frequency. The experimental results are found to fit well a form of Lamb's theory for single-mode operation which has been modified to include gas-collision effects. A theoretical calculation of the saturation parameter is made and the result is found to be in fair agreement with the experimental measurements. (Author)

#### A66-31087

SOME EFFECTS OF NONUNIFORM PUMPING ON THE MODE STRUCTURE OF SOLID STATE LASERS.

Peter J. Warter, Jr. and Ramon U. Martinelli (Princeton University, Dept. of Electrical Engineering, Princeton, N.J.).  
Journal of Applied Physics, vol. 37, Apr. 1966, p. 2103-2111. 8 refs. NSF Grant No. GP-579.

The effects of nonuniform pumping upon the structure of near-axial low-order transverse modes of a laser cavity are considered. For transverse variations of the pumping level, the mode profiles may be severely distorted. The primary cause of the distortion arises from the spatial variation of the anomalous dispersion term in the dielectric constant associated with the laser line. Modes on the high-frequency side of the line center are distorted in such a way as to increase their gain relative to modes lying on or below line center. The results show that mode profile distortions are significant for pumping level variations of a few percent. (Author)

#### A66-31095

OPTICAL PULSES PRODUCED BY LASER LENGTH VARIATION.  
 W. C. Henneberger and H. J. Schulte (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).  
Journal of Applied Physics, vol. 37, Apr. 1966, p. 2189. 5 refs.

Observation of mode locking in a gaseous laser whose cavity is length modulated at the mode separation-frequency. The method, which is similar to that used by Nash and by Harris and Targ (1964), is considered useful for any laser wavelength. A model is proposed to explain the results. R.A.F.

#### A66-31097

INFLUENCE OF SMALL SIGNAL MODULATION ON PHOTOELECTRON COUNTING OF He-Ne LASER INTENSITY FLUCTUATIONS.

P. J. Magill (International Business Machines Corp., Systems Development Div., Endicott, N.Y.).  
Journal of Applied Physics, vol. 37, Apr. 1966, p. 2198, 2199. 5 refs.

Fluctuation study of an rf-excited He-Ne laser. Single-channel photoelectron counting revealed no excess noise just below threshold, but a degree of excess fluctuation was detected just above threshold, in single-mode operation. This excess is shown to be due to a small, sinusoidal modulation of the laser radiation. R.A.F.

#### A66-31098

COMMENTS ON "BEAM DIVERGENCE AND FAR-FIELD PATTERNS OF RUBIES OF VARYING OPTICAL QUALITY."

Dieter Roess (Siemens und Halske AG, Central Laboratories, Munich, West Germany).

Journal of Applied Physics, vol. 37, Apr. 1966, p. 2201, 2202.

Addition to the explanation given by Kellington and Katzman (1965) for the beam divergence they observed in a great number of ruby lasers under identical experimental conditions. On the basis of studies conducted with a CW room-temperature ruby Fabry-Pérot laser, it is suggested that at least part of the divergence observed by Kellington and Katzman is due to thermal effects on the pumping power of the laser and the optical density of the rod. R.A.F.

#### A66-31134

MODES OF A TILTED-MIRROR OPTICAL RESONATOR FOR THE FAR INFRARED.

W. H. Wells (California Institute of Technology, Jet Propulsion Laboratory, Communications Elements Research Section, Quantum Electronics Group, Pasadena, Calif.).

IEEE Journal of Quantum Electronics, vol. QE-2, May 1966, p. 94-102.

In an extension of the work of Fox and Li of Bell Telephone Laboratories, a study was made of the modes of tilted-plane mirrors having enough tilt to use the spillover radiation (at a straight edge) as output coupling. This geometry seems desirable as an oscillator to intercept a molecular beam and extract coherent power in the far infrared. Control of the tilt angle provides variable Q. Amplitude and phase of the output are smooth enough to use cylindrical optics for focusing or collimating the output. The three lowest-order two-dimensional modes were studied which, under reasonable conditions, are determined by a single parameter. It is  $\beta = \alpha(b/\lambda)^{1/2}$ , where  $\alpha$  = mirror tilt,  $b$  = mirror separation, and  $\lambda$  = wavelength. The lowest mode (TEM<sub>0</sub>) has loss per pass that increases almost linearly from 3% at  $\beta = 10^{-2}$  to 37% at  $\beta = 10^{-1}$ . The output appears to diverge from a virtual source about 3b behind the spillover edge of the shorter mirror. The virtual source of the lowest mode is displaced  $(0.7 \text{ to } 1.1)(\lambda b)^{1/2}$  inward from the spillover edge. The mathematical problem proved to be an interesting exercise in devising ways to isolate an eigenfunction of an integral operator when the eigenvalues are nearly equal. (Author)

#### A66-31135

TIME RESOLUTION OF LASER INDUCED ELECTRON EMISSION FROM CESIUM AT HIGH LASER POWER.

Walter L. Knecht (USAF, Systems Command, Research and Technology Div., Avionics Laboratory, Wright-Patterson AFB, Ohio).  
IEEE Journal of Quantum Electronics, vol. QE-2, May 1966, p. 103. 5 refs.

Study of the time resolution of laser-induced electron emission from cesium diodes at a laser power which was high enough to affect cesium diode performance. The experiment is described in detail. The time resolution of laser-induced electron emission from cesium at excess laser power revealed three characteristic peaks pertaining in this sequence to photoemission, plasma produced by the interaction of the laser beam with the cesium surface, and thermionic emission. The peaks decreased with the number of laser shots applied and started to disappear in this order: thermionic emission, plasma emission, photoemission. The approximate upper limit of range of laser power densities not affecting cesium diode performance was found to be  $23.3 \times 10^6$  watts/cm<sup>2</sup>, representing an average value for a specific lot of S-1 cesium diodes. M.F.

**A66-31150**

USE OF A LASER OPERATING IN THE SPIKE MODE TO OBTAIN A HIGH-TEMPERATURE PLASMA.

M. P. Vaniukov, V. I. Isaenko, V. V. Liubimov, V. A. Serebriakov, and O. A. Shorokhov.

(ZHETF Pis'ma v Redaktsiiu, vol. 3, Apr. 15, 1966, p. 316-318.)

JETP Letters, vol. 3, Apr. 15, 1966, p. 205. Translation.

Experimental ionization of air with the aid of radiation from a laser operating in the spike mode, with total generation duration of about 1 msec. One application is to accelerate chemical reactions by obtaining longer action of the electromagnetic field of the light wave on a plasma. The neodymium-glass laser used yielded light pulses with an energy ranging between 800 and 1400 joules.

F. R. L.

**A66-31167 #**

STATISTICAL EFFECTS DURING THE GENERATION OF OPTICAL HARMONICS [O STATISTICHESKIH EFFEKTAH PRI GENERATSII OPTICHESKIKH GARMONIK].

S. A. Akhmanov, A. I. Kovrigin, A. S. Chirkin, and O. N. Chunaev (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR).

(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 50, Apr. 1966, p. 829-843. 25 refs. In Russian.)

Results of experimental and theoretical studies of the statistical effects arising during the generation of the second harmonic in optically transparent crystals. It is shown that the coefficient of correlation between the power of the second harmonic ( $P_2$ ) and the square of the fundamental radiation power ( $P_1$ ) of a solid laser is other than unity and that  $K$  in the equation  $P_2 = KP_1^2$  is a random value. An approximate theory of generation of optical harmonics in a field of randomly modulated waves is developed to explain these results. The theory takes into account both spatial and temporal incoherences of basic radiation. Spatial dimensions are determined for the process of optical-harmonics generation by a limited randomly modulated beam in an anisotropic medium. The cause of the excessive fluctuations of the power of the second harmonic generated in ruby and neodymium lasers is established.

V. Z.

**A66-31175 #**

INDUCED SCATTERING OF LIGHT BY LIGHT [INDUTSIROVANNOE RASSEIANIE SVETA NA SVETE].

A. A. Varfolomeev.

(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 50, Apr. 1966, p. 1024-1035. 6 refs. In Russian.)

Theoretical demonstration that with a laser beam the interaction between fourth-order photons attains a sufficient probability to permit the recording of light-induced light scattering. The cross section of photon-photon scattering in the presence of a third field of equal frequency is calculated. For fields of certain spatial configuration, the scattering cross section is shown to be proportional to the energy density of a third beam near the intersection of two other beams. Some numerical results are given.

V. Z.

**A66-31183 #**

DYNAMICS OF THE GENERATION OF A GIANT PULSE OF COHERENT LIGHT [DINAMIKA GENERATSII GIGANTSKOGO IMPUL'SA KOGERENTNOGO SVETA].

V. S. Letokhov and A. F. Suchkov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 50, Apr. 1966, p. 1148-1155. 16 refs. In Russian.)

Discussion of the development in time and space of a giant pulse produced by a Q-factor-modulated laser. It is shown that such a giant pulse is created by superposition of closely spaced pulses generated by the "neighboring regions" of the laser. The effect of nonuniform density distribution of population inversion on the structure of the giant pulse is examined.

V. P.

**A66-31209**

SPACE-TIME DISTRIBUTION OF THE INITIAL BRIGHTNESS OF A "LASER DISCHARGE" IN AIR [DISTRIBUTION SPATIO-TEMPORELLE DE LA BRILLANCE INITIALE D'UNE "DECHARGE LASER" DANS L'AIR].

Maurice Capet, Vincent Chalmeton, and Renaud Papoular (EURATOM and Commissariat à l'Energie Atomique, Groupe de Recherches sur la Fusion, Fontenay-aux-Roses, Seine, France). Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques, vol. 262, no. 17, Apr. 25, 1966, p. 1125-1128. 6 refs. In French.

Study of the initial pulse observed in the luminous emission of a discharge laser with the aid of a photomultiplier preceded by a mobile iris. A determination is made of the geometrical distribution of the brightness of the discharge during the first phase of its evolution.

A. B. K.

**A66-31217 #**

DETERMINATION OF LASER BEAM ENERGY PROFILE BY A MULTI-LAYER FOIL TECHNIQUE.

M. L. Pilcher and B. A. Tozer (Central Electricity Generating Board, Research Laboratories, Leatherhead, Surrey, England). British Journal of Applied Physics, vol. 17, May 1966, p. 695-697.

A simple technique is described giving information concerning the energy profile of a Q-spoiled laser beam. The method, which employs a number of foils each consisting of  $1.3 \times 10^{-6}$  cm of aluminum deposited on transparent terylene sheet, is suitable for lasers having an output in excess of approximately 0.2 joule. Experimental results obtained with the authors' laser are described, and it is shown that the total area of aluminum removed is proportional to the energy in the laser pulse and is  $1.34 \pm 0.15$  cm<sup>2</sup>/joule ( $4.7 \pm 0.5$  μg/joule) for the foil used, provided the energy density is greater than 0.6 joule/cm<sup>2</sup>. About 94% of the incident energy is reflected by the foils, which must, therefore, be screened to protect personnel.

(Author)

**A66-31244**

APPLICATION OF COHERENT OPTICAL TRANSDUCERS TO OPTICAL REAL-TIME INFORMATION PROCESSING.

Dean B. Anderson (North American Aviation, Inc., Autonetics Div., Anaheim, Calif.).

IN: 1966 SPRING JOINT COMPUTER CONFERENCE, BOSTON, MASS., APRIL 26-28, 1966, PROCEEDINGS. [A66-31239 16-08] Conference sponsored by the American Federation of Information Processing Societies.

Washington, D.C., Spartan Books (AFIPS Conference Proceedings, Volume 28), 1966, p. 53-60. 24 refs.

Naval-supported research.

Delineation of a quasi-microwave approach to coherent infrared transducers and their arrays using photolithographic techniques. Optical information processing systems require the functions of amplification, modulation, and detection to be performed throughout the signal spatial field. These functions can be effectively synthesized by an array of coherent optical transducers extending across the signal spatial field - provided that the spacing between the individual transducers and their size are comparable to the radiation wavelength. The basic image transformation operation is described, and the requirements of a spatial modulator are outlined. Passive and active infrared waveguides are described and diagrammed. M. L.

**A66-31354**

GENERATION OF GIANT PULSES AT 106 μ BY PUMPING NEODYMIUM GLASS LASERS WITH GIANT PULSES FROM A RUBY LASER [ERZEUGEN VON RIESENIMPULSEN BEI 1,06 μm DURCH PUMPEN VON NEODYMLASERN MIT RUBIN-RIESENIMPULSEN].

Dieter Röss and Gerhard Zeidler (Siemens und Halske AG, Zentral-laboratorium, Munich, West Germany).

(Zeitschrift für Naturforschung, Ausgabe A, vol. 21, Apr. 1966, p. 479. In German.)

Discussion of an experiment in which a YAG:Na<sup>3</sup>-laser was pumped with giant pulses from a ruby laser. It is found that at sufficiently short duration of the pumping pulses, a buildup of relaxation pulses in the secondary laser oscillator is observed; the shape of the relaxation pulses is independent of the pumping pulse. For proper laser design, a shortening of the pulse duration relative to the pumping pulse should be expected.

V. P.

**A66-31412****A LARGE-SCREEN REAL-TIME DISPLAY TECHNIQUE.**

Charles E. Baker (Texas Instruments, Inc., Dallas, Tex.) and Anthony D. Rugari (USAF, Systems Command, Electronic Systems Div., Rome Air Development Center, Griffiss AFB, N.Y.).

(Society for Information Display, National Symposium on Information Display, 6th, New York, N.Y., Sept. 29, 30, 1965, Paper.)  
Information Display, vol. 3, Mar.-Apr. 1966, p. 37-39, 42-46.  
8 refs.

Contract No. AF 30(602)-3271.

Evaluation of a novel approach to a large-screen, high-brightness, high-resolution, real-time, projection-display technique. A description is given of the construction and operation of a feasibility model which operates from commercial television broadcasting and uses a high-power Ne-He gas laser. A 40-in. wide, 525-line raster is projected onto a display having between 5 and 10 foot-lamberts highlights brightness. The significance of a laser in a display system is that all the emitted light is usable (unlike conventional light sources) since the apparent source of this light is a diffraction-limited point-dipole radiator. Considerably higher resolutions are possible, and the availability of visible CW lasers in the red, blue, and green parts of the spectrum now makes it possible to design a full-color display. It is concluded that this technique merits serious consideration for some of today's urgent display problems. M. L.

**A66-31443****SPATIAL AND TEMPORAL VARIATION OF THE OPTICAL PATH LENGTH IN FLASH-PUMPED LASER RODS.**

Herbert Welling and Charles J. Bickart (U.S. Army, Electronics Command, Electronics Laboratories, Electronic Components Laboratory, Fort Monmouth, N.J.).

(Optical Society of America, Annual Meeting, Philadelphia, Pa., Oct. 5-8, 1965, Paper.)  
Optical Society of America, Journal, vol. 56, May 1966, p. 611-618.  
21 refs.

Quantitative comparison of the temperature increase of laser material due to an absorption of pump and laser radiation, stress-optical effects, and the varying levels of the active ions. It is shown that the change of the optical pathlength is predominantly determined by temperature variations. Thermal effects are experimentally investigated by an interferometric technique, and the dependence of the optical pathlength variations within the pumping period on pump energy, flash time, pumping arrangement, geometrical configuration, and doping concentration of the laser rod is analyzed for ruby and Nd<sup>+++</sup>-doped glass laser rods. B. B.

**A66-31448 #****PULSED ELECTRODELESS DISCHARGE AS A LIGHT SOURCE FOR LASER EXCITATION AND OBSERVATION OF THE CHARACTERISTICS OF LASER OUTPUT.**

Zung-Kui Chang and Mow-Foh Yeh.

Acta Physica Sinica, vol. 22, Feb. 1966, p. 174-182. 14 refs. In Chinese.

Discussion of experiments in which a high-voltage pulsed electrodeless discharge in a rare gas was used as pumping source for ruby and neodymium-glass lasers. The laser output powers measured are given, and the determination of thresholds is described. The observed spikes and single-mode and damped oscillations are examined. V. P.

**A66-31500 #****A LASER-DOPPLER TECHNIQUE FOR THE MEASUREMENT OF PARTICLE VELOCITY IN GAS-PARTICLE TWO-PHASE FLOW.**

Robert N. James (USAF, Washington, D.C.), Howard S. Seifert (Stanford University, Dept. of Aeronautics and Astronautics, Stanford; United Aircraft Corp., United Technology Center, Sunnyvale, Calif.), and Wayne R. Babcock (United Aircraft Corp., United Technology Center, Physical Sciences Laboratory, Sunnyvale, Calif.).

American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 4th, Los Angeles, Calif., June 27-29, 1966, Paper 66-522. 8 p.

Members, \$0.75; nonmembers, \$1.50.

Contract No. AF 04(611)-10926.

Contribution to the understanding of two-phase nozzle expansion processes, with reference to the combustion of metallic fuel constituents to particulate refractory oxides in rocket engines. Using an He-Ne laser and a Fabry-Pérot scanning plate interferometer, data were obtained in the form of light scattering and number count's velocity for water droplets in subsonic flow, aluminum spheres and alumina abrasive in cold supersonic flow, and aluminum and magnesium oxide in hot supersonic flow. W. M. R.

**A66-31533****EFFICIENT VISIBLE LASERS OF CdS<sub>x</sub>Se<sub>1-x</sub> BY ELECTRON-BEAM EXCITATION.**

C. E. Hurwitz (Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.).

Applied Physics Letters, vol. 8, May 15, 1966, p. 243-245. 11 refs.

Use of electron beam excitation on crystals of the mixed alloy CdS<sub>x</sub>Se<sub>1-x</sub>, with x varying from 0 to 1, to produce laser oscillations at several wavelengths from red to blue with up to 20 watts of peak output power and as high as 11% power efficiency. These results, coupled with others obtained with pn-junction lasers of GaAs<sub>x</sub>P<sub>1-x</sub>, demonstrate that it is now possible to obtain efficient semiconductor lasers anywhere in a continuous range of wavelengths from 4900 to 8400 Å. B. B.

**A66-31535****OPTIMUM DESIGN FOR A ROOM-TEMPERATURE, PULSE-OPERATED GaAs INJECTION LASER.**

A. Akselrad (Radio Corporation of America, RCA Laboratories, Princeton, N.J.).

Applied Physics Letters, vol. 8, May 15, 1966, p. 250-252. 14 refs.  
Research supported by the Radio Corporation of America and the Army.

Modification of the general method of optimizing the laser cavity output coupling for maximum external quantum efficiency, to optimize the design of injection lasers. The analysis, confirmed by experimental results, shows that for a given input current density, the external quantum efficiency can be maximized as a function of length and reflectivity. B. B.

**A66-31536****LASER-INDUCED SPONTANEOUS ELECTRON EMISSION FROM REAR SIDE OF METAL FOILS.**

Walter L. Knecht (USAF, Systems Command, Research and Technology Div., Avionics Laboratory, Wright-Patterson AFB, Ohio).

Applied Physics Letters, vol. 8, May 15, 1966, p. 254-256.

Observation of spontaneous electron emission from the rear side of laser-illuminated 0.05-mm-thick gold, tungsten, and tantalum foils. The electrons possessed a high initial energy and produced sharp pulses which trailed the laser pulse by less than 100 nsec; their peak amplitude varied with the type of foil metal. B. B.

**A66-31537****EFFECT OF LINEAR ABSORPTION ON SELF-FOCUSING OF LASER BEAM IN CS<sub>2</sub>.**

Charles C. Wang and George W. Racette (Ford Motor Co., Scientific Laboratory, Physical Electronics Dept., Blue Bell, Pa.).

Applied Physics Letters, vol. 8, May 15, 1966, p. 256, 257. 10 refs.

Demonstration of the effect of linear absorption on the threshold for self-focusing in CS<sub>2</sub>. The linear absorption coefficient  $\alpha$  in CS<sub>2</sub> was varied from 0.002 cm<sup>-1</sup> to 0.125 cm<sup>-1</sup> by dissolving a controlled amount of iodine in CS<sub>2</sub>. The experimental results are found to be in fair agreement with the theoretical prediction. B. B.

**A66-31547****FINE SPLITTING OF THE LOWER LEVEL OF Cr<sup>+3</sup> IN RUBY AND ITS INFLUENCE ON CERTAIN CHARACTERISTICS OF THE COHERENT RADIATION.**

G. I. Freidman (Gor'kovskii Gosudarstvennyi Universitet, Nauchno-Issledovatel'skii Radiofizicheskii Institut, Gorki, USSR).  
(Radiofizika, vol. 8, no. 2, 1965, p. 272-284.)  
Soviet Radiophysics, vol. 8, Mar.-Apr. 1965, p. 192-200. 12 refs.  
Translation.  
[For abstract see issue 24, page 3595, Accession no. A65-35919]

**A66-31558**

**LASER MODES IN THE PRESENCE OF AN ABSORBING IMPURITY.**  
N. D. Voropaev and A. N. Oraevskii (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).  
(Radiofizika, vol. 8, no. 2, 1965, p. 409-411.)  
Soviet Radiophysics, vol. 8, Mar.-Apr. 1965, p. 294-296. Translation.  
[For abstract see issue 24, page 3595, Accession no. A65-35930]

**A66-31559**

**EXPERIMENTAL INVESTIGATION OF THE MODULATION OF A GAS LASER.**  
I. G. Goncharov (Moskovskii Inzhenerno-Fizicheskii Institut, Moscow, USSR).  
(Radiofizika, vol. 8, no. 2, 1965, p. 411, 412.)  
Soviet Radiophysics, vol. 8, Mar.-Apr. 1965, p. 296, 297.  
Translation.  
[For abstract see issue 24, page 3595, Accession no. A65-35931]

**A66-31593**

**PACKAGING WITH LASER WELDING.**  
J. E. Jackson (Union Carbide Corp., Linde Div., Speedway Laboratories, Indianapolis, Ind.).  
Semiconductor Products and Solid State Technology, vol. 9, May 1966, p. 21-28.  
Discussion of advanced electronic packaging aided by the unique features of laser welding. The number of suitable uses for lasers continues to increase. A variety of interconnecting and component materials have successfully been welded with the laser. These involve similar and dissimilar metal joints including copper, nickel, tantalum, stainless steel, Dumet, Kovar, aluminum, tungsten, titanium, and columbium. The welds generally fall into three categories (which are described separately): interconnection welds, circuit board welds, and special welds. It is noted that laser welding has the advantages of low heat input, the possibility of welding difficult metals, no contact of metal with the weld, and the possibility of microminiature welding. A few basic procedures which should be followed to ensure success with laser welding are listed. M.F.

**A66-31696**

**TUNING OF THE AMMONIA-BEAM MASER BY THE FREQUENCY SHIFT METHOD [ABSTIMMUNG DES AMMONIAKSTRAHL-MASERS MIT DER FREQUENZSPRUNG-METHODE].**  
G. Becker (Physikalisch-Technische Bundesanstalt, Braunschweig, West Germany).  
Zeitschrift für angewandte Physik, vol. 20, no. 5, 1966, p. 398-402. 7 refs. German.  
Application of a method proposed by Bonanomi to the tuning of an ammonia-beam maser resonator. The method is based on the use of abrupt changes in the frequency characteristics of an E0<sub>1n</sub> resonator ( $n > 1$ ). The experiments showed the appearance of a hysteresis of the maser frequency, which depends on the resonator tuning. It was found that this hysteresis, which impairs exact tuning of the resonator, could be eliminated by employing a pulsed ammonia beam. It was observed that the frequency shifts vary in amplitude thus limiting the accuracy of the measurements. A qualitative analysis of this effect of the hysteresis observed is given. V.P.

**WAVELENGTH STABILITY OF A NEON-HELIUM LASER [WELLENLÄNGENSTABILITÄT EINES NEON-HELIUM-LASERS].**

E. Engelhard (Physikalisch-Technische Bundesanstalt, Braunschweig, West Germany).  
Zeitschrift für angewandte Physik, vol. 20, no. 5, 1966, p. 404-407. 16 refs. In German.  
Discussion of the advantages which derive from the utilization of gas lasers for interferometric measurements of lengths. Various methods used to stabilize the wavelength of a gas laser are reviewed. Accurate wavelength measurements performed at the red line ( $\lambda = 6328 \times 10^{-10}$  m) of a stabilized Ne-He laser indicate a wavelength stability of  $\pm 2 \times 10^{-8} \lambda$  over a period of laser operation of 800 hr. A decrease in wavelength of  $6 \times 10^{-8} \lambda$  was observed after 1500 hr of laser operation. V.P.

**STUDIES OF LASER LIGHT SCATTERED BY A MOVING SURFACE**  
Joseph Morgan and R. J. Lysiak (Texas Christian University, Dept. of Physics, Fort Worth, Tex.).  
American Journal of Physics, vol. 34, May 1966, p. 433-436. 9 refs.  
Experiment where visible light from a helium-neon laser was directed onto a white-card surface capable of rotation in order to observe the granularity characteristics of the scattered light. Photographs are given showing the degree of granularity observed under various rotational speeds. It is indicated that the visible granularity, due to the extremely high degree of coherence of the laser light, disappears from view as a consequence of the persistence of vision when the light is scattered by a moving surface. Additional observations relating to the phenomenon of granularity are also presented and discussed. M.F.

**A66-31725 #**

**OPTICAL NEAR FIELD OF A He-Ne LASER.**  
H. J. Caulfield and D. D. Eden (Texas Instruments, Inc., Dallas, Tex.).  
(Optical Society of America, Annual Meeting, Philadelphia, Pa., Oct. 5-8, 1965, Paper.)  
American Journal of Physics, vol. 34, May 1966, p. 439-441. 8 refs.

Observation that, although there is widespread recognition that near-field (Fresnel) diffraction can occur with laser light, this fact seems not to have led to previous systematic study of near-field diffraction at simple apertures. Near-field diffraction at circular apertures is studied in detail. The number of Fresnel zones present in the diffraction pattern is given by  $n = ca^2/\lambda X$ , where  $a$  is the radius of the circle,  $\lambda$  is the wavelength,  $X$  is the distance from the aperture, and  $c$  is a numerical factor which is unity for collimated light, less than unity for convergent light, and greater than unity for divergent light. The near-field beam for collimated light diverges noticeably only for  $\lambda X/a^2 > 0.25$  and reaches the far-field divergence for  $\lambda X/a^2 > 0.7$ . Several practical applications of near-field diffraction are suggested. M.F.

**A66-31727 #**

**LASER LESIONS - CHANGES IN RETINAL EXCITABILITY.**  
A. N. Nicholson and M. J. Allwood (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).  
Nature, vol. 210, May 7, 1966, p. 637, 638.  
Description of experiments on cats to investigate the complex changes following the production of a chorioretinal lesion produced by a pulsed laser beam. The cats were anesthetized by intravenous injection with pentobarbitone-sodium and the right eye enucleated while the pupil of the left eye was fully dilated by an injection of atropine sulfate. Electroretinograms were recorded with a chlorided silver electrode resting on the rim of the cornea; the optic tract potentials were recorded from coaxial electrodes inserted stereotactically. The photic stimulus was generated by a Mazda FA 10 flash tube. Each lesion was produced by a ruby laser with a nominal output of 0.5 joule and pulse duration of 0.5 msec. The changes in the optic tract of the damaged part of the retina indicate localized permanent damage and temporary disorganization of retinoptic mechanisms. D.P.F.

**LASER LESIONS - CHANGES IN RETINAL EXCITABILITY.**  
A. N. Nicholson and M. J. Allwood (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).  
Nature, vol. 210, May 7, 1966, p. 637, 638.  
Description of experiments on cats to investigate the complex changes following the production of a chorioretinal lesion produced by a pulsed laser beam. The cats were anesthetized by intravenous injection with pentobarbitone-sodium and the right eye enucleated while the pupil of the left eye was fully dilated by an injection of atropine sulfate. Electroretinograms were recorded with a chlorided silver electrode resting on the rim of the cornea; the optic tract potentials were recorded from coaxial electrodes inserted stereotactically. The photic stimulus was generated by a Mazda FA 10 flash tube. Each lesion was produced by a ruby laser with a nominal output of 0.5 joule and pulse duration of 0.5 msec. The changes in the optic tract of the damaged part of the retina indicate localized permanent damage and temporary disorganization of retinoptic mechanisms. D.P.F.

**A66-31761**

**LASER LESIONS - CHANGES IN RETINAL EXCITABILITY.**  
A. N. Nicholson and M. J. Allwood (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).  
Nature, vol. 210, May 7, 1966, p. 637, 638.  
Description of experiments on cats to investigate the complex changes following the production of a chorioretinal lesion produced by a pulsed laser beam. The cats were anesthetized by intravenous injection with pentobarbitone-sodium and the right eye enucleated while the pupil of the left eye was fully dilated by an injection of atropine sulfate. Electroretinograms were recorded with a chlorided silver electrode resting on the rim of the cornea; the optic tract potentials were recorded from coaxial electrodes inserted stereotactically. The photic stimulus was generated by a Mazda FA 10 flash tube. Each lesion was produced by a ruby laser with a nominal output of 0.5 joule and pulse duration of 0.5 msec. The changes in the optic tract of the damaged part of the retina indicate localized permanent damage and temporary disorganization of retinoptic mechanisms. D.P.F.

**A66-31764 #**

SOME PECULIARITIES IN COHERENT RADIATION OF GALLIUM ANTIMONIDE LASER DIODES [NEKOTORYE OSOBENNOSTI KOGERENTNOGO IZLUCHENIA LAZERNYKH DIODOV IZ ANTIMONIDA GALLIJA].

I. V. Kriukova, M. S. Mirgalovskaia, V. G. Karnaukhov, A. M. Baranova, and I. A. Strel'nikova.

*Fizika Tverdogo Tela*, vol. 8, Apr. 1966, p. 1028-1034. 19 refs. In Russian.

Observation of a laser effect from gallium antimonide diodes at 77°K. Investigated were p-n junctions of crystals prepared by drawing melts. A peak is established in the coherent radiation at 0.76 to 0.78 eV. The minimum spectral-line halfwidth is  $1.5 \times 10^{-3}$  eV and the threshold current density is  $3 \times 10^3$  to  $1.2^4$  amp/cm<sup>2</sup>. The displacement of the radiation peak and the width of the spectral line are investigated for various injection conditions. A possible mechanism of recombination is discussed. V. Z.

**A66-31767 #**

SEMICONDUCTOR LASER WITH A p-n JUNCTION IN THE InAs<sub>1-x</sub>Sb<sub>x</sub> SYSTEM [POLUPROVODNIKOVYI KVANTOVYI GENERATOR NA p-n-PEREKHODE V SISTEME InAs<sub>1-x</sub>Sb<sub>x</sub>].

N. G. Basov, A. V. Dudenkova, A. I. Krasil'nikov, V. V. Nikitin, and K. P. Fedoseev (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*Fizika Tverdogo Tela*, vol. 8, Apr. 1966, p. 1060-1063. 5 refs. In Russian.

Discussion of the properties of InAs<sub>1-x</sub>Sb<sub>x</sub> single crystals grown by the Czochralski method. The impurity concentration, current carrier mobility, minority carrier lifetime, and dislocation density are determined in crystal samples. The coherent radiation, obtained from the p-n junction of these crystals, has a threshold injection current density of 800 amp/cm<sup>2</sup>. The spectral characteristics of this radiation are investigated. V. Z.

**A66-31788 #**

COHERENT EMISSION OF AN INDIUM ARSENIDE PHOSPHIDE p-n JUNCTION [KOGERENTNOE IZLUCHENIE p-n-PEREKHODA V ARSENIDE-FOSFIDE INDIJA].

P. G. Eliseev, I. Ismailov, A. Ia. Nashed'skii, and V. Z. Ostrovskaya (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*Fizika Tverdogo Tela*, vol. 8, Apr. 1966, p. 1283-1285. 7 refs. In Russian.

Experimental investigation of the coherent emission of diodes prepared from a solid solution of indium arsenide and indium phosphide (containing 6% As). It is found that the coherent light is emitted at a wavelength of 0.942 μ (in the sensitivity band of silicon diodes). The current densities at the generation threshold at 77°K are found to range between  $(2.5 \text{ to } 6.0) \times 10^3$  amp/cm<sup>2</sup>. V. P.

**A66-31802 #**

HARDENING OF STEEL UNDER THE ACTION OF A LASER BEAM [UPROCHNENIE STALEI PRI VOZDEISTVII SVETOVOGO LUCHA LAZERA].

L. I. Mirkin and N. F. Pilipetskii (Moskovskii Gosudarstvennyi Universitet, Nauchno-Issledovatel'skii Institut Mekhaniki, Moscow, USSR).

*Metallovedenie i Termicheskaya Obrabotka Metallov*, Apr. 1966, p. 70-72. 7 refs. In Russian.

Investigation of the effect of a laser beam on hardened and unhardened steel with 0.1 to 0.8% C. A laser beam is found to produce a crater encircled by a zone with a fine crystalline structure and a harder zone containing coarse grains. The effect consists mainly in abrupt temperature changes, with the contribution of pure deformation processes being insignificant. The experimental setup and procedure are described. V. Z.

**A66-31803 #**

ANISOTROPIC REFLECTOR FOR A LASER [ANIZOTROPNYI OTRAZHATEL' DLIYA OPTICHESKOGO KVANTOVOGO GENERATORA].

Iu. I. Kruzhilin.

*Optika i Spektroskopiia*, vol. 20, Apr. 1966, p. 713-715. In Russian.

Consideration of the polarizing properties of a laser reflector consisting of two identical rectangular prisms. The coefficients of reflection are obtained from the Fresnel formula. Curves illustrate the dependence of the reflection factor on the index of refraction and the angle of incidence, beginning with the Brewster angle. One application could be in the realization of rapid Q switching mechanisms of the type described by Daly and Sims. W. M. R.

**A66-31809 #**

MONOCHROMATIZATION OF RADIATION FROM A RUBY COHERENT LIGHT SOURCE [MONOKHROMATIZATSIIA IZLUCHENIA KOGERENTNOGO ISTOCHNIKA SVETA NA RUBINE].

F. A. Korolev and S. M. Mamedzade.

*Akademiia Nauk Azerbaidzhanskoi SSR, Izvestiia, Seriiia Fiziko-Tekhnicheskikh i Matematicheskikh Nauk*, no. 6, 1965, p. 99-106. 12 refs. In Russian.

Description of two methods of obtaining highly monochromatic radiation on a single wave from a ruby laser. The methods use a multiplex resonator with adjustable optical axes in parallel position. With a resonator-component optical length of about 203 mm, monochromatic radiation of a width of the order of  $10^{-2}$  cm<sup>-1</sup> is obtained at room temperature. V. Z.

**A66-31870**

FOCUSED COHERENT RADIATION (LASER) INDUCED DEGRADATION OF SOLID METHYLENE BLUE.

Richard H. Wiley, N. Dunski, and T. K. Venkatachalam (Louisville, University, Dept. of Chemistry, Louisville, Ky.).

*Journal of Heterocyclic Chemistry*, vol. 3, 1966, p. 117, 118. 13 refs.

Contract No. NGR-18-002-005.

Experimental study of the effects, degradation, and reaction products produced when purified, solid methylene blue is exposed to a focused laser beam. Source of the laser beam was a pulsed ruby laser (6943 Å) having an output per flash between 0.4 and 4.0 joules. Samples of 2-7 mg of methylene blue were sealed in tubes and set at the focal point of the focused beam and exposed 1 to 25 times at different spots. The solid was apparently completely volatilized as evidenced by a void at the focal point. The reaction mixture still sealed, was then transferred to a device attached to a gas chromatograph, where it was crushed and the products analyzed. Methane, ethane, and propane were found to have been formed, suggesting that degradation of the methylene blue structure takes place via formation of energetic atoms, carbenes, and radicals from the dimethylamino groups. M. L.

**A66-31884**

MULTIPHOTON PLASMA PRODUCTION AND STIMULATED RECOMBINATION RADIATION IN SEMICONDUCTORS.

C. K. N. Patel, P. A. Fleury, R. E. Slusher, and H. L. Frisch (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

*Physical Review Letters*, vol. 16, May 30, 1966, p. 971-974. 8 refs.

Observation of stimulated recombination radiation from PbTe at its band gap (~6.5 μ) induced by intense 10.6-μ radiation from a Q-switched CO<sub>2</sub> laser. Since no second harmonic can be generated in PbTe, it is believed that this observation provides the first example of multiphoton pair production, where the number of pairs created is sufficient to produce a dense plasma and laser oscillation in the semiconductor. The creation of electron-hole pairs by 10.6-μ radiation in PbTe is considered in the light of Keldysh's finite-frequency generalization of the theory of Zener breakdown. It is shown that nonlinear absorption of radiation in a semiconductor can result in quite large electron-hole pair-production rates and that such pair production is not limited to surface regions of the semiconductor. A. B. K.

**A66-31934**

AT THE END OF THE LASER BEAM, A MORE SENSITIVE PHOTO-DIODE.

L. Arthur D'Asaro (Bell Telephone Laboratories, Inc., Photo Devices Group, Murray Hill, N.J.) and Larry K. Anderson (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).  
Electronics, vol. 39, May 30, 1966, p. 94-98. 7 refs.

Development of new low-noise photodiodes that use avalanche multiplication to achieve high sensitivity. The diodes have a guard-ring diffusion pattern that prevents surface breakdown and thus permits operation in the avalanche multiplication mode. The diodes can detect low-intensity wideband signals impressed on a light beam and can pick up very rapid pulse trains. Both Ge and Si devices have been built. Performance of the diodes in the near IR region of the IR spectrum is superior to any previously reported for microwave photodetectors. M. M.

#### A66-31937

##### CYCLOTRON RESONANCE EXCITATION OF GAS-ION LASER TRANSITIONS.

John P. Goldsborough (Spectra-Physics, Inc., Mountain View, Calif.).

Applied Physics Letters, vol. 8, May 1, 1966, p. 218, 219. 7 refs. Army-supported research.

Study of cyclotron resonance excitation in argon which is believed to provide a high effective E/p ratio, where E is the electric field and p the pressure. Power supplied from a 1-kw CW magnetron was fed into a nonradiating "meander line" structure which produced an electric field parallel to the axis of the laser cavity. The laser output as a function of magnetic field is plotted. B. B.

#### A66-31939

##### SECOND-HARMONIC ENHANCEMENT WITH AN INTERNALLY-MODULATED RUBY LASER.

Roger L. Kohn and Richard H. Pantell (Stanford University, W. W. Hansen Laboratories of Physics, Microwave Laboratory, Stanford, Calif.).

Applied Physics Letters, vol. 8, May 1, 1966, p. 231-233. Contract No. AF 33(657)-11042.

Use of a loss modulator to couple the axial modes of a pulsed ruby laser thereby increasing the second-harmonic (SH) power generated in a nonlinear crystal placed at the output of the laser. The observation of SH enhancement is found to present a sensitive determination of the behavior of a coupled-mode ruby laser. It also permits the indirect measurement of the optical pulse width when the latter is too small to be measured with presently available photodetectors and oscilloscopes, since the enhancement occurs as a time-averaged quantity. B. B.

#### A66-31941

##### LASER OSCILLATION IN CHEMICALLY FORMED CO.

M. A. Pollack (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

Applied Physics Letters, vol. 8, May 1, 1966, p. 237, 238. 9 refs.

Observation of laser oscillation during the flash photolysis of carbon disulphide and oxygen. The oscillation frequencies are found to correspond to those of vibrational-rotational transitions of the ground electronic state of CO; oscillation is seen to result from the chemical production of CO in vibrationally excited states. Laser action has been obtained on a number of transitions not previously observed using electric discharge excitation. B. B.

#### A66-31956

##### p-n JUNCTION LASERS FOR COMMUNICATION SYSTEMS.

Lothar Wandinger and Kenneth L. Kohn (U.S. Army, Electronics Command, Electronics Laboratories, Fort Monmouth, N.J.).  
IEEE Transactions on Aerospace and Electronic Systems, vol. AES-2, May 1966, p. 271-277. 10 refs.

Discussion of design considerations, technological problems, and performance of p-n junction lasers for short range communication systems. Fundamental principles for lasing action in semiconductors are briefly reviewed, and an account is given of previously unpublished technological procedures required to achieve GaAs laser diodes with high output in the coherent beam at a high pulse rate required to operate a pulse-modulated voice transmission system. A description is given of wafer preparation, diffusion of extremely planar p-n junctions, and the formation of ohmic, low-resistance area contacts. B. B.

#### A66-31987

##### COHERENCE AND STATISTICS OF RADIATION.

C. L. Mehta (Rochester, University, Dept. of Physics and Astronomy, Rochester, N.Y.).

IN: LECTURES IN THEORETICAL PHYSICS. VOLUME 7C.

Edited by W. E. Britten.

Boulder, Colo., University of Colorado Press, 1965, p. 345-401. 40 refs. Grant No. DA-ARO-D-31-124G.

Theoretical analysis of general optical coherence functions and their properties, from the viewpoint of statistics. Elementary concepts and exact and quantitative measurements concerning optical coherence are considered, together with applications of coherence to spectroscopy and stellar interferometry. Higher-order coherence phenomena and some of their applications are discussed. The essential differences between the light from a thermal source and that from a laser are characterized; it is seen that second-order coherence functions are completely adequate to describe all the statistical properties of light generated by a thermal source, but that for a nonthermal light one has to go beyond ordinary interference experiments in order to obtain information about the higher-order coherence properties. Treatments are presented which are based on both classical wave theory and statistics and on quantum theory. M. L.

#### A66-32061

##### BREAKDOWN AND HEATING OF GASES UNDER THE INFLUENCE OF A LASER BEAM.

Iu. P. Raizer.

(Uspekhi Fizicheskikh Nauk, vol. 87, Sept. 1965, p. 29-64.)

Soviet Physics - Uspekhi, vol. 8, Mar.-Apr. 1966, p. 650-673. 61 refs. Translation.

[For abstract see issue 01, page 82, Accession no. A66-10646]

#### A66-32072

##### APPLICATIONS OF LASERS TO PHOTOELASTICITY.

C. E. Taylor, C. E. Bowman, (Illinois, University, Urbana, Ill.), W. P. North (Windsor, University, Windsor, Ontario, Canada), and W. F. Swinson (Auburn University, Auburn, Ala.).

(Society for Experimental Stress Analysis, Spring Meeting, Denver, Colo., May 5-7, 1965, Paper.)

Experimental Mechanics, vol. 6, June 1966, p. 289-296. 7 refs. Research supported by the University of Illinois and NSF.

The paper discusses briefly the principles of gaseous and ruby lasers and makes comparisons of pertinent properties of lasers and conventional light sources. Since the output from a laser is a highly collimated beam of monochromatic light that can be made extremely intense and plane polarized, the eminent suitability of lasers as light sources for photoelasticity is suggested. Lasers are shown to be superior to conventional light sources, especially for the scattered-light method and for high-speed dynamic work. Experiments are described and results are given for using lasers for (1) the scattered-light method, (2) a conventional transmission polariscope with static loads and (3) dynamic photoelasticity. (Author)

#### A66-32225 #

##### CONTROL OF GAS LASER EMISSION.

L. N. Magdich.

(Radiotekhnika i Elektronika, vol. 10, Nov. 1965, p. 2070-2072.)

Radio Engineering and Electronic Physics, vol. 10, Nov. 1965, p. 1768-1770. Translation.

[For abstract see issue 04, page 531, Accession no. A66-14059]

**A66-32243**

INTERACTION OF A MOLECULAR BEAM WITH THE ELECTRO-MAGNETIC FIELD OF A RESONATOR. II - STEADY-STATE OSCILLATIONS OF A MOLECULAR GENERATOR WITH A NON-UNIFORM FIELD.

V. B. Tsaregradskii (Gor'kovskii Gosudarstvennyi Universitet, Gorki, USSR).

(Radiofizika, vol. 8, no. 3, 1965, p. 504-512.)

Soviet Radiophysics, vol. 8, May-June 1965, p. 361-367. 8 refs. Translation.

[For abstract see issue 24, page 3566, Accession no. A65-36561]

**A66-32314**

A LASER OPERATED WITH A SATURABLE FILTER.

B. L. Borovich, V. S. Zuev, and V. A. Shcheglov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 49, Oct. 1965, p. 1031-1037.)

Soviet Physics - JETP, vol. 22, Apr. 1966, p. 717-721. 6 refs. Translation.

A rate-equation analysis is performed of the processes in a laser in which a saturable filter is employed for Q switching. It is shown that two modes of excitation of the laser exist (a soft and hard regime). In the hard regime the excitation threshold of the laser is determined by the parameters of the system. It is also demonstrated that when the amplitude of the triggering signal exceeds threshold, a pulse of standard amplitude and width is produced in the system. If spontaneous decay can be neglected, the problem can be solved by quadrature. The condition for generation of a giant pulse and the maximum values of its properties are derived in this case. The limiting values of the decay time and the width of the giant pulse are found. The results of the calculations are compared with experiment. (Author)

**A66-32317**

THE EFFECT OF THE ANOMALOUS DISPERSION ON THE STIMULATED EMISSION SPECTRUM OF CRYSTALS.

N. M. Galaktionova, V. F. Egorova, and A. A. Mak (Gosudarstvennyi Opticheskii Institut, Leningrad, USSR).

(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 49, Oct. 1965, p. 1068-1071.)

Soviet Physics - JETP, vol. 22, Apr. 1966, p. 743-745. 9 refs. Translation.

An effect of anomalous dispersion on the stimulated emission spectrum of  $\text{CaF}_2:\text{Dy}^{2+}$  and  $\text{CaF}_2:\text{U}^{3+}$  crystals is observed, leading to a decrease in the separation between laser modes and making the separation unequal. Under certain conditions the measured wavelength difference for two neighboring laser modes is  $0.4 \lambda^2 / 2 L n_0$ . It is found that the luminescence line in the  $\text{CaF}_2:\text{Dy}^{2+}$  crystal is inhomogeneously broadened. (Author)

**A66-32319**

ON THE THEORY OF THE GAS LASER IN A WEAK LONGITUDINAL MAGNETIC FIELD.

M. I. D'iaconov (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR).

(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 49, Oct. 1965, p. 1169-1179.)

Soviet Physics - JETP, vol. 22, Apr. 1966, p. 812-819. 5 refs. Translation.

Study of the emission from a gas laser in a longitudinal magnetic field assuming that the Zeeman splitting is much smaller than the Doppler linewidth. The frequency of the resonator is assumed to be the same as the atomic frequency in the absence of a magnetic field. The polarizability of the gas in a magnetic field is evaluated with an accuracy to terms quadratic in the electric field strength. The threshold regime is investigated for the case that the Q's for oscillations polarized along the x axis and along the y axis are different. It is shown that as long as the magnetic field strength is smaller than some critical value  $H_0$  the radiation is linearly polarized and the frequency is constant. The polarization direction rotates in the magnetic field from 0 to  $45^\circ$ . In magnetic field strengths exceeding the critical value two modes with different frequencies arise and are

right and left elliptically polarized. The dependence of the critical field, rotation of direction of polarization, and frequency shifts on excitation above the threshold value are investigated qualitatively. For sufficiently intense excitation the beat frequency for  $H > H_0$  depends nonmonotonically on the magnetic field strength and a second region of linear polarization appears. The results of the theory agree with experiment. M. F.

**A66-32353**

ADVANCES IN LASERS AND MASERS.

R. D. Haun, Jr. (Westinghouse Electric Corp., Research Laboratories, Pittsburgh, Pa.).

Industrial Research, vol. 8, June 1966, p. 59-66.

Review of present and possible future applications of lasers and masers. Recent improvements in laser design resulting in more extensive industrial applications, and the developments resulting from long-range research are noted. A new laser television system is described, the possible use of a sun-powered laser in a space communications system is discussed, and the application of the two quantum process to maser amplifier operation is outlined. B. B.

**A66-32408 #**

DOUBLE QUENCHING ON A SELECTIVE DIFFUSED JUNCTION LASER.

Akira Kawaji, Hiroo Yonezu, and Yoshihiro Yasuoka (Nippon Electric Co., Ltd., Semiconductor Industry Div., Kawasaki, Japan). Japanese Journal of Applied Physics, vol. 5, Apr. 1966, p. 340, 341.

Investigation of several types of selective diffused junction lasers. A GaAs laser for a quenching experiment is illustrated. It was found that some of the lasing modes along the long axis disappeared when the transverse lasing modes were quenched at  $77^\circ\text{K}$ . IR photographs were taken in order to observe the distribution of the light emitted by the laser on the three different conditions. The double quenching phenomenon is explained. M. F.

**A66-32433**

NONLINEAR SCATTERING OF A LASER BEAM BY A PLASMA.

G. G. Comisar (Aerospace Corp., El Segundo, Calif.).

Physics of Fluids, vol. 9, May 1966, p. 1037, 1038. 11 refs. Contract No. AF 04(695)-469.

Demonstration that a single ruby laser beam ( $6943 \text{ \AA}$ ) may be used in a nonresonant manner to excite coherent electron-density fluctuations in a gaseous plasma at the second harmonic of the incident frequency. The possibility of observing the resulting nonlinear scattering at the third harmonic ( $2314 \text{ \AA}$ ) with currently available techniques is discussed briefly. A. B. K.

**A66-32509**

PHOTO-EMF OF p-n JUNCTION IN A STRONGLY EXCITED SEMICONDUCTOR.

L. M. Blinov, V. S. Vavilov, and G. N. Galkin (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(ZhETF Pis'ma v Redaktsiiu, vol. 3, May 1, 1966, p. 361-365.) JETP Letters, vol. 3, May 1, 1966, p. 234-236. Translation.

Investigation of the variation of the photo emf with the radiation power of a ruby laser incident on a silicon crystal with a p-n junction. The laser was Q-switched; a set of filters calibrated for high and low radiation power made it possible to cover the light intensity range from  $10^{-1}$  to  $5 \times 10^6$  watts/cm $^2$ . Inasmuch as the donor distribution in the n region of the diffusion p-n junction is extremely uneven, the photo emf deficit may indicate that the part of the potential barrier of the n region due to this inhomogeneity was not lifted. Additional experiments were therefore performed with a shallow p-n junction obtained by bombarding p-type silicon with phosphorus, followed by annealing of the radiation effects. D. P. F.



**A66-32558**

FUNDATIONS OF THE KINETICS OF LASER RADIATION [OSNOVY KINETIKI IZ LUCHENIYA LAZEROV].

V. S. Mashkevich.

Edited by A. S. Davydov.

Kiev, Izdatel'stvo Naukova Dumka, 1966. 236 p. In Russian.

This book discusses problems in laser theory on the basis of the kinetic equations. Particular attention is given to the steady-state generation of laser light at transitions in luminescent centers, at various semiconductor junctions, and under Raman scattering conditions. The stability of the steady-state laser emission is analyzed in some detail. The dynamics of giant pulses is examined. The book is expected to be of use to both scientists and students.

V. P.

**A66-32618**

INTERFEROMETRY THROUGH THE TURBULENT ATMOSPHERE AT AN OPTICAL PATH DIFFERENCE OF 354 m.

R. Bruce Herrick (Corning Glass Works, Raleigh, N. C.) and Jürgen R. Meyer-Arendt (Indiana State University, Dept. of Physics, Terre Haute, Ind.).

(Optical Society of America, Annual Meeting, Philadelphia, Pa., Oct. 6-8, 1965, Paper.)

*Applied Optics*, vol. 5, June 1966, p. 981-983. 11 refs.

A modified Michelson interferometer with a stable He-Ne laser source has been used to study fluctuations in the mean refractive index over a long path through the turbulent atmosphere. Distinct interference fringes were obtained at mirror separations up to 177 m, corresponding to an optical path difference of 354 m. The spatial stability of the interference fringes was found to decrease with increasing optical path length, indicating an increasing contribution from the atmosphere. Details of the interferometer and the experimental procedure are given as well as a discussion of the fluctuations in the mean refractive index.

(Author)

**A66-32619**

INTERFEROMETRY AND LASER CONTROL WITH SOLID FABRY-PÉROT ETALONS.

Don G. Peterson (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Research Laboratories, Palo Alto, Calif.) and Amnon Yariv (California Institute of Technology, Div. of Engineering and Applied Science, Pasadena, Calif.).

*Applied Optics*, vol. 5, June 1966, p. 985-991. 11 refs.

Research supported by the Lockheed Independent Research Fund.

The use and analysis of solid Fabry-Pérot etalons for interferometry and laser control are discussed and supported with experimental data. Low angle scattering is found to be an important factor influencing finesse and peak transmission. Thermal tuning sensitivity and wedge-angle control with thermal gradients are analyzed and illustrated. Control of laser oscillations using a solid-state etalon as a laser cavity end mirror is discussed. The use of the solid etalon as an optical cavity coupler is applied to the problem of sideband energy removal from an internally modulated laser.

(Author)

**A66-32620**

A SUN-PUMPED CW ONE-WATT LASER.

C. G. Young (American Optical Co., Research Div., Southbridge, Mass.).

*Applied Optics*, vol. 5, June 1966, p. 993-997. 12 refs.

USAF-supported research.

One watt of CW laser output has been obtained at room temperature from a sun-pumped, neodymium-doped YAG crystal. The water-cooled laser rod was pumped with a modified Cassegrain sun-tracking telescope consisting of a 61-cm-diam paraboloidal primary mirror collector, a water-cooled hyperbolic-cylindric secondary mirror and a hemispherical cylindric tertiary mirror. The cylindrical image volume was coincident with 24 mm of the 3-mm by 30-mm YAG rod. The spike-free output was obtained for hours at a time with a late October sun at a 42° North latitude. Using the same primary mirror and near-unity numerical aperture refractors, approximately 1.25 watts were obtained in 7 msec pulses from an uncooled, sun-pumped, neodymium-doped, glass rod. Further refinements in the telescope and the laser crystal, and a space environment, should allow 1 watt of laser output to be generated by using a 30-cm-diam collector.

(Author)

**A66-32621**

LASER MODE CONTROL BY INTERNAL MODULATION USING THE TRANSVERSE ELECTROOPTIC EFFECT IN QUARTZ.

G. A. Massey (Sylvania Electric Products, Inc., Sylvania Electronic Systems Div., Mountain View, Calif.).

*Applied Optics*, vol. 5, June 1966, p. 999-1001. 6 refs.

A practical method is described for inducing FM and phase-locked oscillations in a small He-Ne laser at 6328 Å, with negligible reduction of output power. Internal phase modulation was produced using the electrooptic effect in synthetic crystal quartz. Although crystal quartz has a small electrooptic effect, it has nearly ideal optical properties, and excellent optical surfaces can be produced on it; thus, the laser power is not reduced significantly when the modulator crystal is inserted. The laser spectrum and rf mode beats were observed at several modulation frequencies, and suppression of low-frequency amplitude modulation on the output was obtained with stable FM or phase-locked operation. Agreement with the Harris and McDuff FM theory is discussed.

(Author)

**A66-32622**

INVESTIGATION OF THE SPECTRAL WIDTH AND CHANGES IN THE WAVELENGTH OF LIGHT EMITTED BY A TRIGGERED LASER [ETUDE DE LA LARGEUR SPECTRALE ET DES VARIATIONS DE LONGUEUR D'ONDE DE LA LUMIERE EMISE PAR UN LASER DE-CLENCHÉ].

J. Ch. Vienot, A. Orszag, J. Pasteur, R. Saron, and J. Bulabois (Besançon, Université, Laboratoire d'Optique, Besançon, France).

*Applied Optics*, vol. 5, June 1966, p. 1003-1007. 12 refs. In French.

Research supported by the Direction des Recherches et Moyens d'Essais.

Determination of the importance of the frequency shift with respect to spectral width for single pulses by measurements of variations of the emitted wavelength as a function of time. A high-speed rotating-mirror camera was used. The time resolution was about 3.2 nsec. Results obtained from streak photographs of Fabry-Pérot rings are described.

M. M.

**A66-32627**

STIMULATED EFFECTS IN N<sub>2</sub> AND CH<sub>4</sub> GASES.

T. A. Wiggins, R. V. Wick, and D. H. Rank (Pennsylvania State University, Dept. of Physics, University Park, Pa.).

*Applied Optics*, vol. 5, June 1966, p. 1069-1072. 11 refs.

Navy-supported research.

Stimulated Brillouin scattering from N<sub>2</sub> and CH<sub>4</sub> using a giant-pulse laser has been observed in an arrangement whereby the laser cannot release and amplify the back-scattered radiation. This allows a quantitative study of the parameters affecting stimulated Brillouin scattering. The back-scattered beam converges at the same angle at which the laser beam diverges. The Brillouin component can have a narrow spectral width, one-third that of the laser itself, and in some cases can have a duration of only a few nanoseconds. N<sub>2</sub> at high pressure can back-scatter as much as 45% of the incident power. The speeds of sound in CH<sub>4</sub> and N<sub>2</sub> have been measured at lower pressures than were previously reported.

(Author)

**A66-32628**

OSCILLATION CONDITIONS FOR SUPERRADIANT AND FEED BACK AMPLIFIER LASERS.

Thomas R. Carver (Princeton University, Palmer Physical Laboratory, Princeton, N.J.).

*Applied Optics*, vol. 5, June 1966, p. 1090, 1091. 6 refs.

Observations concerning the laser as a superradiant, directionally coherent, or coherence-brightened emission device. It is shown that the oscillation conditions for such lasers are exactly the same as those for feedback lasers.

R. A. F.

**A66-32635****LARGE WAVELENGTH CHANGES WITH CAVITY Q IN INJECTION LASERS.**

G. C. Dousmanis and D. L. Staebler (Radio Corporation of America, RCA Laboratories, Princeton, N.J.).  
Journal of Applied Physics, vol. 37, May 1966, p. 2278-2280.  
 7 refs.

Research sponsored by the Radio Corporation of America; Contract No. DA-28-043-AMC-01214(E).

Observation that changes in the cavity Q of GaAs lasers, aside from changing the threshold, cause large changes in the laser wavelength. The wavelength changes by about  $\pm 0.6\%$  when the threshold is varied by a factor of two to three by changing the surface reflectivity. For comparable fractional changes in Q (or threshold) the wavelength changes are larger at 300°K than at lower temperatures. The wavelength dependence on Q is specific to semiconductor lasers and is based on the continuous nature of the energy levels involved in stimulated emission. The wavelength shifts are theoretically related to the changes in Q using the "band-filling" model and an exponential density in "tail" states. Fair agreement with the data is obtained at low temperature as well as at 300°K. The wavelength shift with Q in conjunction with changes in the shape of the threshold-vs-temperature curve leads to a correction to the usual relation between threshold and losses. The wavelength dependence on Q can be used for frequency control and possibly for frequency modulation.

M. F.

**A66-32638****INTERACTION OF LASER RADIATION WITH AN ABSORBING SEMI-INFINITE SOLID BAR.**

S. S. Penner and O. P. Sharma (California, University, Dept. of the Aerospace and Mechanical Engineering Sciences, and Institute for Radiation Physics and Aerodynamics, La Jolla, Calif.).  
Journal of Applied Physics, vol. 37, May 1966, p. 2304-2308.  
 7 refs.

Army-supported research.

Discussion of the initial heat transfer and stress-wave development which occur prior to ablation and thermal equilibration in the exposure of solid and liquid materials to laser sources. Thermal stress development in partially transparent rods may be studied by using a laser source for controlled energy deposition. The relevant heat-transfer problem for a one-dimensional geometry is solved, and some experiments for studying stress wave evolution prior to ablation and thermal equilibration are briefly indicated.

M. M.

**A66-32689****INTENSITY NOISE IN MULTIMODE GaAs LASER EMISSION.**

A. W. Smith and J. A. Armstrong (International Business Machines Corp., Thomas J. Watson Research Center, Yorktown Heights, N.Y.).  
IBM Journal of Research and Development, vol. 10, May 1966, p. 225-232. 11 refs.

As presently manufactured, most GaAs lasers have several lasing modes when the injection current is more than 25% above threshold. This paper describes the noise properties of three groups of multimode lasers operating CW at 10°K, classified on the basis of their subthreshold spectra. Two main types of intensity noise have been found: (1) low-frequency nonstationary noise which occurs when a weak mode is lasing in competition with a strong mode, and (2) broad-band stationary noise which occurs when two modes are about equal in intensity. The first type of noise is believed to arise from heat transfer processes in the diodes and dewar, while the second is probably the partition noise which must occur when a photon can be stimulated into one of a number of lasing modes. An important result of these experiments is that the total noise for all modes is very small, being comparable to that for a single mode with the same total power.

(Author)

**A66-32716****THEORY OF PARAMETRIC OSCILLATOR THRESHOLD WITH SINGLE-MODE OPTICAL MASERS AND OBSERVATION OF AMPLIFICATION IN LiNbO<sub>3</sub>.**

G. D. Boyd and A. Ashkin (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).  
Physical Review, 2nd Series, vol. 146, June 3, 1966, p. 187-198.  
 23 refs.

Theoretical and experimental results are given on CW parametric amplification and oscillation. Theoretical calculations incorporating Gaussian-mode theory into parametric-amplifier theory indicate that continuous parametric oscillation in LiNbO<sub>3</sub> using a gas-laser pump source should be achievable with tens of milliwatts of pump power. The requirements for achieving simultaneous resonance of signal and idler frequencies under phase-matched conditions for parametric oscillators are discussed. The effects of varying crystal temperature, electric field, and pump frequency to satisfy these requirements are included. The experiments involved the measurement of difference-frequency power at 0.9299  $\mu$  (10,754 cm<sup>-1</sup>) produced in LiNbO<sub>3</sub> by mixing a signal at 1.1526  $\mu$  (8676 cm<sup>-1</sup>) from the He-Ne laser with a pump at 0.5147  $\mu$  (19,430 cm<sup>-1</sup>) from an argon ion laser. The LiNbO<sub>3</sub> crystal was adjusted in temperature so as to obtain phase matching normal to its optic axis, thus avoiding the deleterious effects of double refraction. The observed amplification was found to be in agreement with theory. Experimental results are given demonstrating low-loss resonators for the signal and idler frequencies, the loss being approximately 1% per pass. Data showing the dependence of optical path length in an optical resonator on temperature and electric field are given. The variation of the phase-matching condition with electric field is demonstrated in a second-harmonic-generation experiment.

(Author)

**A66-32820****RETARDATION-TYPE, LASER MODULATORS.**

James L. Hobart.

Spectra-Physics Technical Memorandum, 1966. 4 p. 6 refs.

Discussion of types of lasers suitable for applications in which the optical power output is to be modulated in response to an incoming electrical signal, known as retardation-type lasers, with an essentially capacitive load for the driving source. The driving power, transmission, and dynamic range of such lasers are discussed. The Twyman-Green and electrooptic types of retardation devices are described. Modulation processes based on the Kerr effect and on the Pockels effect are considered.

D. P. F.

**A66-32959 #****THE APPLICATION OF LASERS TO TIME-RESOLVED FLOW VISUALIZATION.**

L. H. Tanner (Belfast, Queen's University, Belfast, Northern Ireland).

Journal of Scientific Instruments, vol. 43, June 1966, p. 353-358.  
 9 refs.

Demonstration of the possibility of producing, by means of the coherent laser light, the very bright, narrow, flat beam of light required in streak photography of transient flow. Even a low-power laser can give a narrower and brighter beam, and hence improved space and time resolution. A framing camera may be produced by scanning the beam with a rotating mirror, and this also would permit the use of a low-power laser for visualization of high-speed turbulent flows. Any of the usual methods of visualization may be used, including holography, interferometry, schlieren or shadow photography. Experimental results are presented which show that the expected good resolution may in fact be obtained in practice.

M. M.

**A66-32963****STUDY OF POWER ENHANCEMENTS DURING THE INITIAL AND AFTERGLOW TRANSIENTS OF PULSED He-Ne GAS LASERS.**

P. Burlamacchi (Consiglio Nazionale delle Ricerche, Centro Microonde, Florence, Italy) and R. Pratesi (Firenze, Università, Istituto di Fisica Superiore, Florence, Italy).  
Nuovo Cimento, vol. 43B, May 11, 1966, p. 150-165. 22 refs.

Research supported by the Consiglio Nazionale delle Ricerche.

Discussion of the mechanism producing power enhancements in pulsed He-Ne gas lasers operating at 0.63 and 1.15  $\mu$ . Strong power

overshoots were observed in both lines when the rf discharge was modulated with a square wave. In the visible transition a fast discharge rise time was necessary. An analysis of discharge formation showed that fast discharge rise times can be attained if a sufficient number of suitably spaced electrodes is employed. M.M.

**A66-33049 #**

OPEN ASYMMETRIC SPHERICAL RESONATORS FOR LASERS.

E. E. Fradkin.

(*Optika i Spektroskopiia*, vol. 20, Feb. 1966, p. 316-323.)

(*Optics and Spectroscopy*, vol. 20, Feb. 1966, p. 168-172. 11 refs. Translation.

[For abstract see issue 15, category 16, Accession no. A66-29200]

**A66-33050 #**

EFFECT OF CONFIGURATION OF A RESONATOR ON THE INTENSITY OF LASER RADIATION.

V. N. Kuriatov and E. E. Fradkin.

(*Optika i Spektroskopiia*, vol. 20, Feb. 1966, p. 324-326.)

(*Optics and Spectroscopy*, vol. 20, Feb. 1966, p. 172-174. 6 refs. Translation.

[For abstract see issue 15, category 16, Accession no. A66-29201]

**A66-33053 #**

NONLINEAR QUENCHING OF THE LUMINESCENCE OF RUBY UNDER INTENSE EXCITATION.

N. A. Tolstoi and A. P. Abramov.

(*Optika i Spektroskopiia*, vol. 20, Feb. 1966, p. 345-349.)

(*Optics and Spectroscopy*, vol. 20, Feb. 1966, p. 187, 188. Translation.

[For abstract see issue 15, category 16, Accession no. A66-29204]

**A66-33058 #**

CHANGE IN TEMPERATURE OF A MEDIUM UNDER THE ACTION OF A LASER PULSE.

V. N. Rudenko.

(*Optika i Spektroskopiia*, vol. 20, Feb. 1966, p. 370, 371.)

(*Optics and Spectroscopy*, vol. 20, Feb. 1966, p. 204, 205. Translation.

[For abstract see issue 15, category 16, Accession no. A66-29209]

**A66-33059 #**

SHADOW PROJECTIONS OF A SPARK IN AIR OCCURRING WHEN LASER RADIATION IS BROUGHT TO FOCUS.

G. M. Malyshev, G. V. Ostrovskaya, and T. Ia. Chelidze.

(*Optika i Spektroskopiia*, vol. 20, Feb. 1966, p. 374, 375.)

(*Optics and Spectroscopy*, vol. 20, Feb. 1966, p. 207, 208. Translation.

[For abstract see issue 15, category 16, Accession no. A66-29210]

**A66-33117**

ON THE POSSIBILITY OF ANOMALOUS DIFFUSION EFFECTS IN CONTINUOUS-DUTY ION LASERS IN MAGNETIC FIELDS.

Edward J. Powers (Texas, University, Dept. of Electrical Engineering and Dept. of Physics, Austin, Tex.).

IEEE, *Proceedings*, vol. 54, May 1966, p. 804, 805. 12 refs.

Research supported by the Texas Atomic Energy Research Foundation; Grant No. AF AFOSR 766-65.

Discussion of a possible anomalous effect occurring when a strong axial magnetic field is applied to a constant-current discharge in a continuous-duty ion laser. It is pointed out that if the applied magnetic field is raised to a sufficiently high value, a plasma phenomenon called anomalous diffusion may dominate the discharge, as a result of which the charged-particle density and, consequently, the laser output will be decreased. A.B.K.

**A66-33126**

THRESHOLD CURRENT OF A SEMICONDUCTOR LASER.

G. E. Pikus (Akademiia Nauk SSSR, Institut Poluprovodnikov, Leningrad, USSR).

(*Fizika Tverdogo Tela*, vol. 7, Dec. 1965, p. 3536-3547.)

(*Soviet Physics - Solid State*, vol. 7, June 1966, p. 2854-2862.

20 refs. Translation.

[For abstract see issue 08, page 1234, Accession no. A66-19612]

**A66-33127**

LINE WIDTH OF A SEMICONDUCTOR LASER.

G. E. Pikus and A. G. Aronov (Akademiia Nauk SSSR, Institut Poluprovodnikov, Leningrad, USSR).

(*Fizika Tverdogo Tela*, vol. 7, Dec. 1965, p. 3548-3557.)

(*Soviet Physics - Solid State*, vol. 7, June 1966, p. 2863-2869.

5 refs. Translation.

[For abstract see issue 08, page 1234, Accession no. A66-19613]

**A66-33134**

LASER ACTION IN Cds INDUCED BY TWO-PHOTON OPTICAL EXCITATION FROM A RUBY LASER.

N. G. Basov, A. Z. Grasiuk, I. G. Zubarev, and V. A. Katulin (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(*Fizika Tverdogo Tela*, vol. 7, Dec. 1965, p. 3639, 3640.)

(*Soviet Physics - Solid State*, vol. 7, June 1966, p. 2932, 2933.

Translation.

[For abstract see issue 08, page 1277, Accession no. A66-19620]

**A66-33246**

PHYSICAL MECHANISM OF MOLECULAR LASERS [MECANISME PHYSIQUE DES LASERS MOLECULAIRES].

L. Henry (Paris, Université, Laboratoire de Spectroscopie Moléculaire, Paris, France) and F. Legay (Centre National de la Recherche Scientifique; Paris, Université, Faculté des Sciences, Paris, France).

(*Société Française des Electroniciens et des Radioélectriciens, Demi-Journée d'Etudes, Paris, France, Dec. 15, 1965, Paper.*)

(*L'Onde Electrique*, vol. 46, Apr. 1966, p. 410-416. 28 refs. In French.

Review of the physical mechanism of molecular lasers including some fundamental relationships relating to the vibrational rotation of molecules. The transitions of radiation states, intermolecular collisions, and molecular collisions with the walls are described. The mechanism of molecular lasers is discussed. D.P.F.

**A66-33247**

A CO<sub>2</sub> LASER [LE LASER A CO<sub>2</sub>].

A. Truffert and Ph. Vautier (Société Anonyme de Télécommunications, Paris, France).

(*Société Française des Electroniciens et des Radioélectriciens, Demi-Journée d'Etudes, Paris, France, Dec. 15, 1965, Paper.*)

(*L'Onde Electrique*, vol. 46, Apr. 1966, p. 417-422. 20 refs. In French.

Description of the characteristics of CO<sub>2</sub> lasers. A carbon dioxide laser requires about 1% of the exciting power required for a conventional laser, for the same power output. The properties of the CO<sub>2</sub> molecule are reviewed. The manner in which such a laser operates is described, and the effect of temperature, excitation mode, pressure, nature of the auxiliary gases, and the arrangement of the mirrors in the resonant cavity are considered. Applications for this type of laser, which operates in the IR range of the spectrum, are discussed. D.P.F.

**A66-33248**

HIGH-POWER MOLECULAR LASER [LASER MOLECULAIRE DE GRANDE PUISSANCE].

X. Ziegler and Ch. Frapard (Compagnie Générale d'Electricité de Paris, Centre de Recherches, Département Recherches Physiques de Base, Marcoussis, Seine-et-Oise, France).

(*L'Onde Electrique*, vol. 46, Apr. 1966, p. 423-427. 14 refs. In French.

Review of the principles of molecular laser operation with particular reference to devices with high-power outputs. Molecular lasers, the operation of which is based on vibrational-rotational energy levels of the fundamental ground state, generate coherent waves in the IR region of the spectrum. The design and operation of a  $\text{CO}_2$ - $\text{N}_2$ -He laser are discussed. It is found that the power output of such lasers is proportional to volume of gas utilized; in the future, therefore, laser outputs which are now of the order of hundreds of watts, may be greatly increased.

D. P. F.

**A66-33249****ION LASERS [LES LASERS IONIQUES].**

G. Convert (Compagnie Générale de Télégraphie sans Fil, Centre de Physique Electronique et Corpusculaire, Paris, France). *L'Onde Electrique*, vol. 46, Apr. 1966, p. 428-433. 12 refs. In French.

Description of the operating principles and characteristics of ion lasers, in which the electron transitions involve atoms or molecules which have already lost one or more of their electrons. While the transitions in neutral atoms produce emissions which are chiefly located in the IR, the transitions for ionized atoms completely cover the visible range of the spectrum and extend to the near UV. A laser with ionized argon gas is described in detail. Total power output is considered, and the effect of an applied magnetic field is discussed.

D. P. F.

**A66-33250****FLUORESCENT-SOLID LASER [LASER A SOLIDES FLUORESCENTS].**

O. K. Deutschbein and C. C. Pautrat (Centre National d'Etudes des Télécommunications, Département Physique, Chimie, Métallurgie, Issy-les-Moulineaux, Seine, France). *L'Onde Electrique*, vol. 46, Apr. 1966, p. 434-444. 16 refs. In French.

Review of the different types of lasers and an analysis of the performance and characteristics of fluorescent-solid lasers. A table is given in which laser characteristics such as concentration of active atoms/cm<sup>3</sup>, effective volume, total number of active atoms, and power output are listed for different types of lasers. Fluorescence phenomena and three-level lasers are discussed, and optical oscillators and resonant cavities are treated. Laser materials are compared, and examples are given of several fluorescent-solid lasers.

D. P. F.

**A66-33252****FREQUENCY STABILIZATION OF GAS LASERS [STABILISATION DE LA FREQUENCE DES LASERS A GAZ].**

P. Laures (Compagnie Générale d'Electricité de Paris, Centre de Recherches, Département Recherches Physiques de Base, Marcoussis, Seine-et-Oise, France). (Société Française des Electroniciens et des Radioelectriciens, Demi-Journée d'Etudes, Paris, France, Dec. 15, 1965, Paper.) *L'Onde Electrique*, vol. 46, Apr. 1966, p. 455-462. 30 refs. In French.

Description of specially designed and constructed lasers which have high frequency stability. Such devices are isolated as much as possible from mechanical shocks and thermal fluctuations. The optical length is continuously adjusted by a servo mechanism to stabilize the frequency of the emitted light. The frequency variation inherent in the operation of a laser is analyzed. Also treated are Rowley and Wilson's experiments in amplitude modulation of a laser. A method for laser stabilization known as the "Lamb dip" method is described and it is shown that frequency stabilization requires precise control of the gas pressure, tolerable gas impurities, and geometry of the resonant cavity.

D. P. F.

**A66-33256**

**DISTRIBUTION OF THE PARTICLES EMITTED BY FOCUSING A LASER BEAM ON A SOLID TARGET [REPARTITION DES PARTICULES EMISES PAR FOCALISATION D'UN FAISCEAU LASER SUR UNE CIBLE SOLIDE].**

Alain Ducauze and Philippe Langer (Commissariat à l'Energie Atomique, Centre d'Etudes de Limeil, Service Documentation, Villeneuve-Saint-Georges, Seine-et-Oise, France). *Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques*, vol. 262, no. 21, May 23, 1966, p. 1398-1401. 7 refs. In French.

Study of the electron and ion emission patterns produced by focusing a pulsed laser on solid targets of Be, C, Al, Ni, and Au. The effect of the various parameters on the emission patterns is examined. The laser beam is focused on a target in a vacuum of  $5 \times 10^{-6}$  torr and the particles emitted are gathered by 32 Faraday cylinders which are located equidistant from the point of focus.

D. P. F.

**A66-33300****CRYSTAL MOSAIC STRUCTURES AND THE LASING PROPERTIES OF GaAs LASER DIODES.**

D. A. Shaw, K. A. Hughes, N. F. B. Neve, D. V. Sulway, P. R. Thornton (Wales, University, University College of North Wales, Dept. of Materials Science, Bangor, Caern., Wales), and C. Gooch (Services Electronics Research Laboratory, Baldock, Herts., England).

*Solid-State Electronics*, vol. 9, June 1966, p. 664, 665. 6 refs.

Observation that during a recent fabrication of GaAs lasers one crystal gave significantly poorer lasers than two others. A scanning electron microscope (SEM) was used to examine p-n junctions made in these crystals. This initial examination revealed that the small regions of relatively gross mosaic which occur in most crystals lead to very deep diffusion "spikes" when zinc is diffused into laser-quality GaAs crystals. The preliminary results are suggestive of a correlation between the occurrence of these regions of "spikes" and poor laser performance. It is suggested that these diffusion faults could lead to the known filamentary nature of the laser action in existing diodes. In the experiment, of the three slices examined, that from the crystal which gave inferior laser performance contained such spikes over the entire junction length.

M. F.

**A66-33304 #**

**LASER BASED ON EXCITATION OF A  $\text{GaP}_{1-x}\text{As}_x$  SOLID SOLUTION BY A BEAM OF FAST ELECTRONS [OPTICHESKII KVANTOVYI GENERATOR S VOZBUZHDENIEM PUCHKOM BYSTRYKH ELEKTRONOV NA TVERDOM RASTVORE  $\text{GaP}_{1-x}\text{As}_x$ ].**  
N. G. Basov, O. V. Bogdankevich, P. G. Eliseev, and B. M. Lavrushin (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*Fizika Tverdogo Tela*, vol. 8, May 1966, p. 1341, 1342. In Russian.

Report on the observation of coherent radiation at 7040 Å from a  $\text{GaP}_{1-x}\text{As}_x$  crystal cooled by liquid nitrogen and excited by a fast electron beam. The radiation spectra, the radiation pattern and the dependence of the radiation intensity on the current density of the electron beam are given.

V. Z.

**A66-33316 #****INTERFEROMETRIC STUDY OF THE MODES OF A VISIBLE-GAS LASER WITH A MICHELSON INTERFEROMETER.**

J. J. ten Bosch and M. J. A. de Voigt (Utrecht, State University, Physics Laboratory, Utrecht, Netherlands).

*American Journal of Physics*, vol. 34, June 1966, p. 479-482. 5 refs.

A simple Michelson interferometer and a red He-Ne laser were used to measure the visibility of interference fringes as a function of pathlength difference of the two beams. The number and intensity of axial modes could thus be determined for various degrees of longitudinal coherence, obtained by deadjustment of the laser-mirror system. The experiment may be used as a student exercise.

(Author)

**A66-33322 #**

**THEORY OF FAR INFRARED DETECTION USING NONLINEAR OPTICAL MIXING.**

Masamoto Takatsuji (Hitachi, Ltd., Central Research Laboratory, Tokyo, Japan).  
Japanese Journal of Applied Physics, vol. 5, May 1966, p. 389-400. 19 refs.

The possibility of far-infrared detection using nonlinear optical mixing with lasers is discussed. For the detection of the mixed wave a visible spectrometer and a photomultiplier whose response time is very short ( $<10^{-8}$  sec) should be used. The noise sources are entirely different from those of conventional far-infrared detectors and the most serious one is laser background noise. The use of polarizers is proposed for the elimination of the noise of this type. A preliminary experiment using Glan-Thompson polarizers and a grating spectrometer showed that, when a ruby laser and a 0.5-cm-thick crystal of CdS are used, the minimum detectable power of  $10^{-5}$ - $10^{-8}$  watt can be expected, corresponding to a far-infrared wavelength of 1000-100  $\mu$ . This value would be further improved by using better or more polarizers, a higher dispersion spectrometer, or more efficient mixing materials. The production of far-infrared emission by beating two lasers and detecting by the mixing with one of them in the same material is also considered. A detection free of serious noise is shown to be possible only for crystals having point symmetry of 32, 3 m and 6 m 2.

(Author)

#### A66-33325 #

##### HIGH-REPETITION PULSED $\text{Nd}^{3+}$ GLASS LASER.

Toshiro Kamogawa, Hiroaki Kotera, and Heijiro Hayami (Matsushita Electric Industrial Co., Central Research Laboratory, Osaka, Japan).  
Japanese Journal of Applied Physics, vol. 5, May 1966, p. 449. 5 refs.

Development of a low-threshold  $\text{Nd}^{3+}$ -glass laser oscillator which made possible repetitive operation up to 200 pps. A photograph of laser oscillation at 30 pps is shown. The output power was estimated at 1 mJoule per pulse at 4-joules input. The major problem encountered was sputtering of flash tube electrodes. M. M.

#### A66-33334 #

##### THEORETICAL ASSESSMENT OF A HIGH POWER CONTINUOUS-WAVE 4-LEVEL SOLID LASER.

A. C. Selden (United Kingdom Atomic Energy Authority, Atomic Weapons Research Establishment, Aldermaston, Berks., England).  
British Journal of Applied Physics, vol. 17, June 1966, p. 729-736. 20 refs.

The performance of a steady-state continuous-wave four-level laser is analyzed on the basis of a simplified model in which conditions are assumed to be uniform throughout the laser. It is shown that the model remains a close approximation to this assumption for reflectivities greater than 50%, and it is further shown that this includes the region of practical interest. Within this region the laser power output is proportional to length (for uniform pumping and optimized mirror reflectance) and decreases rapidly as host losses increase. The upper and lower limits to the input power density, set respectively by the thermomechanical properties of the host material and the minimum threshold power requirement, are defined for a cylindrical laser rod. It is shown that there is a maximum value of laser cross-sectional area for which continuous-wave operation is possible and which is inversely proportional to the host loss coefficient. Calculations performed for  $\text{Nd}^{3+}$ : glass show that this material is theoretically capable of producing some tens of watts continuous-wave power.

(Author)

#### A66-33346

##### A READOUT TECHNIQUE FOR THE LASER FOG DISDRUMETER.

Brian J. Thompson, George B. Parrent, John H. Ward, and Bruce Justh (Technical Operations Research, Burlington, Mass.).  
(American Meteorological Society, National Meeting, 237th, Washington, D.C., Apr. 20-23, 1965, Paper.)  
Journal of Applied Meteorology, vol. 5, June 1966, p. 343-348. 10 refs.

Contract No. AF 19(628)-3813.

Review of the concept and design of a disdrometer and discussion of a new readout technique from a both a theoretical and experimental viewpoint. The new readout is based on the fact that the diffraction patterns stored by the instrument are a new type of hologram. The stored diffraction pattern can be used to create a real three-dimensional image of the diffraction pattern. B. B.

#### A66-33348

##### LIGHT SCATTER FROM A LASER BEAM AT HEIGHTS ABOVE 40 KM.

W. C. Bain and M. C. W. Sandford (Science Research Council, Radio and Space Research Station, Slough, Bucks., England).  
Journal of Atmospheric and Terrestrial Physics, vol. 28, June-July 1966, p. 543-552. 9 refs.

Light scatter from the upper atmosphere has been studied by firing a Q-switched ruby laser pulse vertically upward and examining the return signal. A detectable amount of light has been measured from heights up to 75 km. In the height range 40-60 km a curve with the expected height variation for molecular scattering can be fitted to the results. Above 60 km the return is greater than this, the discrepancy being especially significant at heights around 71 km. In Oct. 1965 there was no sign of an intense return from layers above 75 km.

(Author)

#### A66-33509 #

##### SPECTRAL DISTRIBUTION OF A RUBY LUMINESCENCE YIELD [SPEKTRAL'NOE RASPREDELLENIE VYKHODA LIUMINESTSENTSII RUBINA].

Z. L. Morgenshtern and V. V. Neustruev.  
Optika i Spektroskopiia, vol. 20, May 1966, p. 837-841. 10 refs. In Russian.

Investigation of the spectral distribution of the luminescence yield of a ruby for wavelengths of 157 to 550 m $\mu$ . A rapid growth of the absorption coefficient, due to the presence of Cr, and the existence of a luminescence excitation band with a near-unity quantum yield are established for  $\lambda < 210$  m $\mu$ . Two mechanisms of luminescence excitation, believed to be active in a ruby, are described.

V. Z.

#### A66-33510 #

##### INVESTIGATION OF THE COHERENCE IN RADIATION PEAKS OF A RUBY LASER [ISSLEDOVANIIE KOGERENTNOSTI IZLUCHE-NIYA LAZERA NA RUBINE V PIKAKH].

I. I. Dukhopel, T. V. Simonenko, and I. E. Urnis.  
Optika i Spektroskopiia, vol. 20, May 1966, p. 853-858. 9 refs. In Russian.

Experimental study of the coherence in radiation peaks of a ruby laser by scanning the interference field produced by a superposition of beams from various sections of the crystal face. A shift in interference bands is revealed in the radiation peaks. The origin of the shift is discussed.

V. Z.

#### A66-33512 #

##### MEASUREMENT OF THE AMPLIFICATION OF COHERENT OPTICAL RADIATION IN A TUBE CONTAINING A MIXTURE OF HELIUM AND NEON [IZMERENIE USILENIIA KOGERENTNOGO OPTICHESKOGO IZLUCHE-NIYA V TRUBKE SO SMES'YU GELII-NEON].

A. P. Skibarko and Iu. V. Prichko.  
Optika i Spektroskopiia, vol. 20, May 1966, p. 908-910. In Russian.

Description of a method for measuring the small values of amplification of coherent laser radiation produced by a tube of neon and helium. The experimental setup and procedure are described. The method is effective when the laser radiation yield is stable. V. Z.

#### A66-33514 #

##### COMPETITION OF TRANSITIONS AND EMISSION ON THE 6401-Å LINE IN AN He-Ne LASER USING A RESONATOR WITHOUT A DISPERSING PRISM [O KONKURENTSII PEREKHODOV I POLUCHENII GENERATSII NA LINII 6401 Å BEZ DISPERGIRUIUSHCHEI PRIZMY V REZONATORE He-Ne LAZERA].

L. S. Vasilenko and V. P. Chebotayev.

Optika i Spektroskopiia, vol. 20, May 1966, p. 915, 916. In Russian.

Brief note on the effect of the competition of  $3s_2-2p_4$  and  $3s_2-3p_4$  transitions on the performance of an He-Ne laser with an active discharge length from 20 to 140 cm. The dependence of the amplification of radiation on the discharge length is investigated. The experimental procedure is described. V. Z.

Observation of optical modulation in bulk GaAs using the Gunn effect. Evidence is given to indicate that an optical beam focused through a free-running or driven Gunn oscillator is modulated at the operating frequency by the traveling high-field domains. The optical beam is said to serve as an effective probe in an investigation of the mechanisms and properties of these bulk instabilities. B. B.

#### A66-33515 #

THEORETICAL STUDY OF GENERATION CONTROL IN A RUBY LASER, USING A DIFFRACTION MODULATOR WITH A MODULATED TRAVELING ULTRASONIC WAVE [TEORETICHESKOE ISSLEDOVANIIE UPRAVLENIIA GENERATSIEI RUBINOVOGO OKG S POMOSHCH'IU DIFRAKSIONNOGO MODULIATORA NA BEGUSHCHEI MODULIROVANNOMI UL'TRAZVUKOVOI VOLNE].

A. G. Pokrovskii and M. A. Filippova.

Optika i Spektroskopiia, vol. 20, May 1966, p. 921-923. In Russian.

Discussion of the nature of radiation of a ruby laser controlled by a diffraction modulator with a modulated traveling ultrasonic wave. The study is based on the kinetic equations of population balance which are solved by an electronic computer. The time-dependent behavior of the radiation density, excess population, and characteristic damping is given in diagram form. V. Z.

#### A66-33614

A SOLID-STATE CW OPTICALLY PUMPED MICROWAVE MASER. E. S. Sabisky and C. H. Anderson (Radio Corporation of America, RCA Laboratories, Princeton, N. J.).

Applied Physics Letters, vol. 8, June 1, 1966, p. 298-300. 9 refs. Research sponsored by the Radio Corporation of America and DOD.

Observation of microwave amplification and oscillation at X-band frequencies by the selective absorption of circularly polarized light by the Zeeman levels of the ground state of divalent thulium in calcium fluoride. This maser uses the properties of the selective absorption of circularly polarized light which occurs in the broad bands associated with the impurity ion, and thus the restrictions on the frequency of the pump radiation are relaxed to a great extent. B. B.

#### A66-33516 #

EXPERIMENTAL STUDY OF EMISSION CONTROL IN A RUBY LASER, USING A DIFFRACTION MODULATOR WITH A MODULATED TRAVELING ULTRASONIC WAVE [EKSPERIMENTAL'NOE ISSLEDOVANIIE UPRAVLENIIA GENERATSIEI RUBINOVOGO OKG S POMOSHCH'IU DIFRAKSIONNOGO MODULIATORA NA BEGUSHCHEI MODULIROVANNOMI UL'TRAZVUKOVOI VOLNE].

I. I. Adrianova, Iu. V. Popov, and V. E. Terent'ev.

Optika i Spektroskopiia, vol. 20, May 1966, p. 924-926. In Russian.

Brief description of experiments in which the normal pulse generation of a ruby laser was periodically modified by a modulated ultrasonic wave from a diffraction modulator installed between the ruby and the outer mirror of the interferometer. The block diagram of the experimental setup and photographs of the pulse sequences obtained are given. V. Z.

#### A66-33615

OBSERVATION OF CW INTERMODULATION EFFECT IN THE  $3.39\text{-}\mu$  He-Ne LASER.

Donald H. Close (Hughes Aircraft Co., Research Laboratories, Malibu; California Institute of Technology, Pasadena, Calif.).

Applied Physics Letters, vol. 8, June 1, 1966, p. 300-303. 9 refs. USAF-supported research.

Observation of the first- and second-order sidebands due to strong CW signals in a  $3.39\text{-}\mu$  laser amplifier, and quantitative comparison of the observation with theory. The two source lasers had cavities 60 to 100 cm long, formed by a high-reflectivity spherical mirror of 120-cm radius, and a flat output mirror consisting of a thin silicon film on a quartz substrate. B. B.

#### A66-33616

AN EXPERIMENTAL INFRARED RADAR.

E. D. Mills (Massachusetts Institute of Technology, Lincoln Laboratory, Solid State Div., Lexington, Mass.), N. A. Sullivan (Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.), and J. W. Meyer (Massachusetts Institute of Technology, Lincoln Laboratory, Radio Physics Div., Lexington, Mass.).

Microwave Journal, vol. 9, Feb. 1966, p. 33, 34, 37.

Description of feasibility experiments and design considerations for the radar indication of cloud height and visibility utilizing gallium arsenide diode lasers as a pulsed IR source. Operation in the near IR allows valid correlation with visual effects, yet the actual probe remains invisible. The operation of the radar is described and its detection of a variety of targets discussed along with a number of suggestions for improvements of this rudimentary system. M. F.

#### A66-33557

A LASER RADAR RANGING SYSTEM USING PSEUDO-RANDOM-CODE MODULATION.

Jesse B. Sherman (Cooper Union, Dept. of Electrical Engineering, New York, N. Y.).

IEEE Transactions on Education, vol. E-9, Mar. 1966, p. 2-9. 15 refs.

Description of a laser ranging system intended for a variety of experience in an advanced electrical engineering undergraduate projects laboratory. Pseudo-random coding is applied to the laser beam via a KDP crystal modulator, by means of digital-module circuitry and silicon-controlled rectifier circuitry. The equipment lends itself to a number of studies in pulse and digital circuitry, statistical communication theory, and electrooptical engineering. Other uses of the laser, which is of the low-power CW helium-neon type, are mentioned. M. M.

#### A66-33758 #

INVERSION MECHANISMS, POPULATION DENSITIES AND COUPLING-OUT OF A HIGH-POWER MOLECULAR LASER.

W. J. Witteman (Philips' Gloeilampenfabrieken, Philips Research Laboratories, Eindhoven, Netherlands).

Philips Research Reports, vol. 21, Apr. 1966, p. 73-84. 14 refs.

The paper deals with the excitation mechanism, relaxation processes and coupling-out in a closed molecular-gas laser of 2 m length, filled with carbon dioxide, nitrogen and water vapor. An

output of 20 watts and an energy-conversion efficiency of 12% are reported. A description is given of the construction and use of an adjustable, loss-free coupling-out mechanism which allows not only of finding the operating conditions of maximum radiation output but also of measuring interesting data concerning the inversion. These data yield information about the excitation and deactivation processes concerned. It is shown that in the absence of water vapor, i.e., with a gas mixture of only  $\text{CO}_2$  and  $\text{N}_2$ , the deactivation of the lower laser level determines the rate of production of the radiation. However, the presence of water vapor plays a prominent part in the depopulation of the lower laser level by collisional relaxation, as proved by, among others, the observation that the output increases by at least a factor of 2 as compared with the absence of water vapor in the molecular laser. It is shown that in the presence of water vapor the excitation rate of the upper laser level is rate-determining for the radiation production. An analysis of the relaxation processes is given. The vibrational energy of the water vapor and of the carbon dioxide are described by "vibrational temperatures." The effective thermal relaxation time of water vapor, as deduced from such data, is in substantial agreement with relaxation data of water vapor reported by several authors working with ultrasonic absorption and shock-wave experiments. It explains the fact that a maximum of radiation should be produced at the observed partial pressure of water vapor. The population densities during the discharge of the upper and lower laser levels are calculated for the case of absence of laser action and for the case of maximum laser action. Finally the high efficiency of the laser process is discussed.

(Author)

**A66-33767**

## PROGRESS IN IONIZED-ARGON LASERS.

Roy A. Paananen (Raytheon Co., Research Div., Lexington, Mass.), *IEEE Spectrum*, vol. 3, June 1966, p. 88-99. 26 refs.

Discussion of the discovery and progress of ionized noble gas lasers, using the standard operation of ~1-watt units to exemplify their typical characteristics. Problems encountered in the development of higher argon laser power (5 to 100 watts) are considered, notably those associated with the inversion mechanism and the effects of an axial magnetic field. Current technological trends, uses, and prospects in the field are outlined.

V. Z.

**A66-33793 #**

## LASERS VS MICROWAVES IN SPACE COMMUNICATIONS.

S. Gubin, R. B. Marsten, and D. Silverman (Radio Corporation of America, Defense Electronic Products, Astro-Electronics Div., Princeton, N. J.), *Journal of Spacecraft and Rockets*, vol. 3, June 1966, p. 818-827. 37 refs.

Comparison of communications systems operating at microwave and optical frequencies for application to a Mars mission in the early 1970's. Characteristics of present and future laser and microwave systems are compared, and their effects on complete satellite systems are evaluated.

B. B.

**A66-33794 #**

## PERFORMANCE OF COMMUNICATION SYSTEMS BETWEEN MANNED SPACECRAFT ON INTERPLANETARY VOYAGES.

R. B. Marsten, D. Silverman, and S. Gubin (Radio Corporation of America, Defense Electronic Products, Astro-Electronics Div., Princeton, N. J.), *American Institute of Aeronautics and Astronautics, Annual Meeting, 2nd, San Francisco, Calif., July 26-29, 1965, Paper 65-324.*

*Journal of Spacecraft and Rockets*, vol. 3, June 1966, p. 828-833. 13 refs.

[For abstract see issue 19, page 2762, Accession no. A65-30519]

**A66-33795 #**

## AIDS TO ACQUISITION IN OPTICAL COMMUNICATION.

E. B. Moss (Douglas Aircraft Co., Inc., Missile and Space Div., Advance Electronics Dept., Santa Monica, Calif.), *(Institute of Navigation, and American Institute of Aeronautics and Astronautics, National Space Navigation and Spacecraft Communication Meeting, Houston, Tex., Apr. 29, 30, 1965, Paper.)* *Journal of Spacecraft and Rockets*, vol. 3, June 1966, p. 834-838. 5 refs.

[For abstract see issue 17, page 2422, Accession no. A65-28249]

**A66-33839 #**

## CONTRIBUTION TO THE THEORY OF UNDAMPED INTENSITY PULSATIONS OF QUANTUM GENERATORS [K TEORII NEZATUKHAIUSHCHIKH PUL'SATSII INTENSIVNOSTI KVANTOVYKH GENERATOROV].

N. G. Basov, V. N. Morozov, and A. N. Oraevskii (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*Akademiia Nauk SSSR, Doklady*, vol. 168, May 21, 1966, p. 550-553. In Russian.

Derivation of an analytical solution of the conservative equation  $\dot{x} + x(x-1) - \dot{x}^2/x = 0$ , where  $x$  is the radiation intensity. The solution obtained is used to determine the characteristics of several modes of solid-state laser operation. The analysis is developed for a laser system proposed by Basov et al.

V. P.

**A66-33840 #**

## DETERMINATION OF ELECTRON TEMPERATURE AND CONCENTRATION IN A PLASMA ARC FROM THE THOMSON SCATTERING OF LASER RADIATION [OPREDELENIE TEMPERATURY I KONTSENTRATSII ELEKTRONOV V PLAZME DUGI PO TOMSONOV-SKOMU RASSEIANIIU LAZERNOGO IZLUCHENIIA].

G. M. Malyshev, G. V. Ostrovskaja, G. T. Razdobarin, and L. V. Sokolova (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR).

*Akademiia Nauk SSSR, Doklady*, vol. 168, May 21, 1966, p. 554, 555. 9 refs. In Russian.

Experimental determination of the electron temperature and concentration in a dc arc in a magnetic field from the radiation scattered in the plasma. The apparatus and procedure employed are described. The electron temperature, determined from the half-width of the profile of scattered light, was found to be  $T_e = 1.8$  eV (for  $\Delta\lambda = 43 \text{ \AA}$ ); the electron concentration was found to equal  $2.5 \times 10^{13} \text{ cm}^{-3}$ , which is in good agreement with results obtained by the probe method. Gerry's parameter  $\alpha$ , calculated from these values, was found to equal 0.04, which confirmed that the effect encountered in the experiment was Thomson scattering at the plasma electrons.

V. P.

**A66-33924**

## LASER INTERFEROMETRY OF A DROPPING MERCURY ELECTRODE.

J. Leja (British Columbia, University, Dept. of Mineral Engineering, Vancouver, Canada) and R. N. O'Brien (Alberta, University, Dept. of Chemistry, Edmonton, Alberta, Canada).

*Nature*, vol. 210, June 18, 1966, p. 1217-1219. 7 refs.

Research supported by the National Research Council of Canada.

Description of the first qualitative results on transport mechanisms around a dropping mercury electrode, using a long-path interferometer (identical to short-path models described previously but substituting a laser for a sodium vapor lamp). Interferograms of the dropping mercury electrode are shown. It is pointed out that improvement in photographic techniques and measurement of the refractive index of lead nitrate solutions at the laser wavelength will soon make it possible to obtain quantitative results. Meanwhile, there would seem to be no doubt that concentration polarization, not spatially spherical or constant with time of electrolysis around the drop, is dependent on applied voltage and natural convection.

M. F.

**A66-33939**

## PHOTOCONDUCTIVITY OF DIELECTRICS UNDER THE INFLUENCE OF LASER RADIATION.

V. S. Dneprovskii, D. N. Klyshko, and A. N. Penin (Moskovskii Gosudarstvennyi Universitet, Fizicheskii Fakul'tet, Moscow, USSR). (ZHETF Pis'ma v Redaktsiiu, vol. 3, May 15, 1966, p. 385-389.) JETP Letters, vol. 3, May 15, 1966, p. 251-253. 7 refs. Translation.

Preliminary results of observation of the photoconductivity induced in uncolored NaCl and  $Al_2O_3$  single crystals by radiation from a ruby laser. The investigated sample was placed in a parallel-plate capacitor charged to a voltage  $E_0 \sim 1$  kv, and the laser flash induced a charge in the capacitor which was observed on an oscilloscope. B. B.

#### A66-33941 PHOTOCONDUCTIVITY OF RUBY WHEN STRONGLY IRRADIATED BY A RUBY LASER.

T. P. Belikova and E. A. Sviridenkov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR). (ZHETF Pis'ma v Redaktsiiu, vol. 3, May 15, 1966, p. 394-398.) JETP Letters, vol. 3, May 15, 1966, p. 257-259. Translation.

Observation of photoconductivity in ruby exposed to strong light from a ruby laser. The photoconductivity was observed at an irradiation power of  $\sim 10^{10}$  watts/cm<sup>2</sup>, prior to the onset of damage in the ruby, in a very small range of incident-light intensities. An oscillogram showing the photoconductivity pulse and laser pulses spaced 20  $\mu$ sec apart is given. B. B.

#### A66-34000

LASER ACTION ON SEVERAL HYPERFINE TRANSITIONS IN Mn I. W. T. Silfvast and G. R. Fowles (Utah, University, Dept. of Physics, Salt Lake City, Utah). Optical Society of America, Journal, vol. 56, June 1966, p. 832, 833. 5 refs.

NSF-supported research.

Observation of laser action on the six strong hyperfine components of the  $6P_{7/2} - 6D_{9/2}$  transition at 5341 Å in Mn I. Laser action is found to occur on a total of six green lines of a  $6P^0 - 6D$  multiplet and also on four infrared lines from a lower-lying  $6P^0$  level to the same  $6D$  level. It is shown that laser action on the various hyperfine components of the very strong 5341-Å transition can be controlled by changing the cavity Q with various mirrors. A. B. K.

#### A66-34059

F.M. OF A HIGH FREQUENCY MODULATED He-Ne LASER BEAM BY ULTRASONICS.

Paolo Emilio Giua and Luciano Palmieri (Consiglio Nazionale delle Ricerche, Istituto Nazionale di Ultracustica, Rome; Perugia, Università, Istituto di Fisica, Perugia, Italy). Ricerca Scientifica, vol. 36, Feb. 1966, p. 106-108. 7 refs. Research supported by the Consiglio Nazionale delle Ricerche.

Description of an ultrasonic cell which modulates the intensity of a laser beam at 80 Mc and gives rise to a luminous carrier that can be additionally modulated to transmit intelligence. The unusual feature of this cell is that its high modulation frequency may be varied continuously, thus permitting a frequency modulation of the modulated luminous carrier. Experiments performed by a special arrangement made it possible to obtain satisfactory speed and music transmission. M. M.

#### A66-34159

BAND STRUCTURE AND LASER ACTION IN  $Pb_{1-x}Sn_x$ -xTe.

J. O. Dimmock, I. Melngailis, and A. J. Strauss (Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.). Physical Review Letters, vol. 16, June 27, 1966, p. 1193-1196. 9 refs.

Observation of coherent and spontaneous emission in the vicinity of 15  $\mu$  from  $Pb_{1-x}Sn_x$ -xTe alloys at 12°K optically excited by radiation from a GaAs-diode laser. A model of the band structure of the alloy system is proposed to explain the composition dependence of the band gap and the change in sign of the temperature coefficient of the band gap between PbTe and SnTe. B. B.

#### A66-34178

$CaF_2:Dy^{2+}$  LASER OPERATING IN A REPETITIVE GIANT-PULSE MODE WITH CONTINUOUS PUMPING.

V. K. Koniukhov, V. V. Kostin, L. A. Kulevskii, T. M. Murina (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR), and A. M. Prokhorov.

(Akademiia Nauk SSSR, Doklady, vol. 165, Dec. 11, 1965, p. 1056-1058.) Soviet Physics - Doklady, vol. 10, June 1966, p. 1192, 1193. 8 refs. Translation.

[For abstract see issue 08, page 1234, Accession no. A66-19376]

#### A66-34181

THE ZEEMAN EFFECT IN GASEOUS LASERS.

N. N. Rozanov and A. V. Tulub.

(Akademiia Nauk SSSR, Doklady, vol. 165, Dec. 21, 1965, p. 1280-1283.) Soviet Physics - Doklady, vol. 10, June 1966, p. 1209-1211. 7 refs. Translation.

[For abstract see issue 08, page 1234, Accession no. A66-19638]

#### A66-34236

ENERGY-LOSS PROCESSES IN OPTICAL-FREQUENCY GAS BREAKDOWN.

David C. Smith and Alan F. Haught (United Aircraft Corp., Research Laboratories, East Hartford, Conn.).

Physical Review Letters, vol. 16, June 13, 1966, p. 1085-1088.

Investigation using the focused beam of a Q-spoiled neodymium laser to obtain measurements of the optical-frequency breakdown threshold of mixtures of the inert gases. It is shown that the addition of a small amount of neon to argon at  $5 \times 10^4$  torr reduces the breakdown threshold of the mixture below that of the pure argon. Although the argon-neon combination is a Penning gas mixture, the phenomenon observed is not the familiar enhancement of ionization in neon by the addition of a small quantity of argon but a reduction in the threshold of argon by the addition of the more difficult-to-ionize neon. Results obtained with the argon-neon mixture using neodymium radiation are included. At a test-gas pressure of  $5 \times 10^4$  torr, pure argon has a threshold of  $3.2 \times 10^6$  v/cm, while for a 1%-neon, 99%-argon mixture, the breakdown threshold is reduced to  $1.9 \times 10^6$  v/cm. M. L.

#### A66-34296 #

LASER SURFACE MEASURING SYSTEM.

R. Justice and T. Charlton (Andrew Corp., Orland Park, Ill.).

IN: CONFERENCE ON THE DESIGN AND CONSTRUCTION OF LARGE STEERABLE AERIALS, LONDON, ENGLAND, JUNE 6-8, 1966. [A66-34262 18-09]

Conference sponsored by the Electronics Division of the Institution of Electrical Engineers, the Institution of Electronic and Radio Engineers, the Institution of Mechanical Engineers, the Institution of Structural Engineers, and the United Kingdom and Eire Section of the Institute of Electrical and Electronics Engineers. London, Institution of Electrical Engineers (IEE Conference Publication No. 21), 1966, p. 177-181.

Research sponsored by the Andrew Corp.

Description of a simple laser system which is considered to be of promise for monitoring the surface contours of large steerable antennas under dynamic conditions. A method is outlined for measuring the contours with the system. R. A. F.

#### A66-34557

DYNAMIC-STRESS CONCENTRATION USING PHOTOELASTICITY AND A LASER LIGHT SOURCE.

W. P. T. North (Windsor, University, Mechanical Engineering Dept., Windsor, Ontario, Canada) and C. E. Taylor (Illinois, University, Urbana, Ill.).

(Society for Experimental Stress Analysis, International Congress on Experimental Mechanics, 2nd, Washington, D.C., Sept. 28-Oct. 1, 1965, Paper.)

Experimental Mechanics, vol. 6, July 1966, p. 337-341. 11 refs.



Since experimental techniques using dynamic photoelasticity are, in general, limited by suitably intense monochromatic light sources, it was of primary importance to describe a ruby-laser system which would completely remove this particular aspect of the problem. Modulation of the system, in this case by a Kerr cell, provides the necessary control of the light output such that a complete series of results can be obtained by putting together the results of many individual tests recorded on a conventional still camera. In this case, the dynamic-stress-concentration factor in a strut with a symmetrically located circular discontinuity was determined to establish definitely the potential of the system.

(Author)

#### A66-34681 #

DISINTEGRATION OF TRANSPARENT DIELECTRICS UNDER THE EFFECT OF INTENSE LASER RADIATION [RAZRUSHENIE PROZRACHNYKH DIELEKTRIKOV POD DEISTVIE MOSHCHNOGO LAZERNOGO IZLUCHENIYA].

B. M. Ashkinadze, V. I. Vladimirov, V. A. Likhachev, S. M. Ryvkin, V. M. Salmanov, and I. D. Laroshetskii (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR). *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, vol. 50, May 1966, p. 1187-1201. 8 refs. In Russian.

Experimental investigation of the disintegration of alkali-halide single crystals (LiF, NaCl, CsI, KBr, KI), polymers (Plexiglas, polystyrene), and glasses (molten quartz, silicate glass) under laser radiation. The nature of disintegration under the influence of ordinary and giant pulses is established, as is the dependence of the dimensions of the region of disintegration on energy, position of the focus, focus length, and temperature. Possible mechanisms of disintegration are examined.

V. P.

#### A66-34685 #

WAVE INTERACTION IN A GAS LASER [O VZAIMODEISTVII VOLN V GAZOVOM LAZERE].

B. L. Zhelnov, A. P. Kazantsev, and V. S. Smirnov (Akademiia Nauk SSSR, Sibirskoe Otdelenie, Institut Fiziki Poluprovodnikov, Novosibirsk, USSR). *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, vol. 50, May 1966, p. 1291-1295. 8 refs. In Russian.

Discussion of the interaction of traveling waves in a ring laser. The interaction of the waves is shown to result from the nonlinearity of the medium and coupling of waves reflected from the mirrors. It is shown that the latter mechanism provides a satisfactory explanation of the forcing-of-oscillations effect and the traveling-wave-suppression effect.

V. P.

#### A66-34691 #

ROLE OF LIGHT ABSORPTION BY FREE CARRIERS IN A SEMICONDUCTOR LASER [O ROLI POGLOSHCHENIYA SVETA SVOBODNYMI NOSITELIAMI V POLUPROVODNIKOVOM LAZERE].

V. S. Mashkevich and V. L. Vinetskii (Akademiia Nauk Ukrainskoi SSR, Institut Fiziki, Kiev, Ukrainian SSR). *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, vol. 50, May 1966, p. 1410-1414. 9 refs. In Russian.

Discussion of the kinetic equations of a stationary semiconductor/radiation system, taking into account the photon absorption by free current carriers. Three different solutions, applicable at different levels of photon absorption, are shown to exist for these equations. An undoped semiconductor with direct interband radiative transitions is treated as an example.

V. Z.

#### A66-34695 #

CROSS SECTIONS OF NONELASTIC PROCESSES IN A HELIUM-NEON LASER [SECHENIYA NEUPRUGIKH PROTSESSOV V GELI-NEONOVOM LAZERE].

I. M. Beterov and V. P. Chebotaev. *Optika i Spektroskopiia*, vol. 20, June 1966, p. 1078-1080. 10 refs. In Russian.

Brief discussion of the technique and results of the pumping of metastable  $2^3S$  atoms of He in an He-Ne laser. The experimental cross sections of the decay of these He atoms are in fair agreement with those obtained by Jovan and Bennett.

V. Z.

#### A66-34696 #

PROBLEM OF TEMPERATURE EFFECTS IN AN He-Ne LASER [K VOPROSU O TEMPERATURNYKH EFFEKTAKH V He-Ne LAZERE].

S. A. Gonchukov, G. A. Ermakov, G. A. Mikhnenko, and E. D. Protsenko.

*Optika i Spektroskopiia*, vol. 20, June 1966, p. 1083-1085. In Russian.

Discussion of the variations in the output radiation power of an He-Ne laser, caused by the variations in the concentration of neutral atoms in the discharge tube during a glowing discharge. The dependence of the radiation output power on pressure and on the concentration of nonexcited atoms at various temperatures is shown in diagram form. Theories are proposed to explain the results.

V. Z.

#### A66-34697 #

GENERATION DUE TO 4f-3d TRANSITIONS IN NEON DURING THE OPTICAL PUMPING OF A DISCHARGE IN AN He-Ne MIXTURE BY AN He-TUBE [GENERATSIIA NA PEREKHODAKH 4f-3d NEONA PRI OPTICHESKOI NAKACHKE GELIEVOI LAMPOI RAZRIADA V SMESI He-Ne].

V. N. Lisitsyn and V. P. Chebotaev.

*Optika i Spektroskopiia*, vol. 20, June 1966, p. 1087, 1088. In Russian.

Brief note on the generation of radiation due to high-energy-level transitions excited in an He-Ne laser during optical pumping with an He lamp. Generation is attained at 4f-3d transitions on wavelengths of 1.8281 and 1.8287  $\mu$ .

V. Z.

#### A66-34904

POWER AND ENERGY MEASURING TECHNIQUES FOR SOLID STATE LASERS.

D. E. Killick, D. A. Batemen, D. R. Brown, T. S. Moss, and E. T. de la Perrelle.

*Infrared Physics*, vol. 6, June 1966, p. 85-109. 5 refs.

Methods of measuring the energy and power of a Q-switched neodymium glass laser in the range  $10^{-3}$  to 1 joule and  $10^4$  to  $10^8$  watts are described. Calorimetric devices using disks, cones, and wire were constructed for energy measurements and are discussed with respect to construction, materials, and calibration. Power measuring systems using vacuum and silicon photodiodes are also described. Of the five detectors investigated, the wire calorimeter and silicon photodiode systems were developed, and an experiment in which the two detectors were used simultaneously to measure the laser output showed good agreement between the results.

(Author)

#### A66-34967

PLASMA DIAGNOSTICS BY LIGHT SCATTERING ON ELECTRONS.

G. M. Malyshev (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR).

(*Zhurnal Tekhnicheskoi Fiziki*, vol. 35, Dec. 1965, p. 2129-2142.)

*Soviet Physics - Technical Physics*, vol. 10, June 1966, p. 1633-1643. 35 refs. Translation.

[For abstract see issue 10, page 1569, Accession no. A66-21990]

#### A66-35034

LINEAR INSTABILITY THEORY OF LASER PROPAGATION IN FLUIDS.

K. A. Brueckner and S. Jorna (California, University, Institute for Radiation Physics and Aerodynamics, La Jolla, Calif.).

*Physical Review Letters*, vol. 17, July 11, 1966, p. 78-81. 13 refs. Contract No. DA-31-124-ARO(D)-257.

Demonstration that coupling between light and the medium can lead to rapidly growing instabilities, hence, to large density fluctuations, in laser propagation in fluids. It is shown that any small-scale structure in the laser beam, either present initially or caused

by inhomogeneities in the medium, is thereby enhanced, resulting in large intensity changes and so in anomalous gain. M.M.

#### A66-35244

**HOLOGRAPHY - THE RECONSTRUCTION OF WAVEFRONTS.**  
Dennis Gabor (London, University, Imperial College of Science and Technology, Dept. of Electrical Engineering, London, England). (Institution of Electrical Engineers, Electronics Div., London, England, May 11, 1966, Lecture.)

*Electronics and Power*, vol. 12, July 1966, p. 230-234.

Account of the principles and development of holography. Wave-front reconstruction and Lippmann photography are considered, and the possible applications of holography to communications and television are mentioned. Finally, the contribution of laser light is discussed. B.B.

#### A66-35285 #

**POSSIBILITY OF MEASURING THE LUNAR FIGURE AND ORBIT PARAMETERS BY THE OPTICAL LOCATION METHOD [O VOZ-MOZHNOСТИ IZMERENIIA PARAMETROV FIGURY I ORBITY LUNY METODOM OPTICHESKOI LOKATSII].**

Iu. L. Kokurin, V. V. Kurbasov, V. F. Lobanov, V. M. Moshzherin, A. N. Sukhanovskii, and N. S. Chernykh.

*Kosmicheskoe issledovanie*, vol. 4, May-June 1966, p. 414-426.

12 refs. In Russian.

Discussion of the energy aspects of lunar probing by means of ruby lasers and of the associated time-resolution problem. It is shown that, due to the low resolution that results from beam scattering in the earth's atmosphere, it is not possible to measure the distance between the earth and the moon with an accuracy sufficient for astronomical purposes, and that the difficulties associated with the energy level of contemporary lasers and atmospheric scattering may be overcome by installation of a special light reflector on the lunar surface. The parameters of the reflector are computed and the conditions for its location are established. V.P.

#### A66-35321

**ABSOLUTE BOLOMETER WATTMETER FOR MEASURING THE OUTPUT POWER OF CW LASER.**

Iu. A. Skliarov, V. A. Sedel'nikov, and L. I. Kats (Saratovskii Gosudarstvennyi Universitet, Nauchno-Issledovatel'skii Institut Mekhaniki i Fiziki, Saratov, USSR).

(*Priboi i Tekhnika Eksperimenta*, vol. 10, Nov.-Dec. 1965, p. 165-167.)

*Instruments and Experimental Techniques*, June 1966, p. 1478-1480. 5 refs. Translation.

[For abstract see issue 09, page 1381, Accession no. A66-20364]

#### A66-35353 #

**FLOW SURVEY FOR A FREE PISTON SHOCK TUBE BY MEANS OF A PULSED LIGHT OF He-Ne GAS LASER.**

Hakuro Oguchi, Katsushi Funabiki, Taro Tsuyuki, and Kenjiro Iwasaki.

Tokyo, University, Institute of Space and Aeronautical Science, Bulletin, vol. 2, Apr. 1966, p. 467-475. 9 refs. In Japanese.

Investigation of the characteristic features of a high-temperature flow in a shock tube driven by a free-piston compression. In order to analyze the high temperature flow caused by this type of shock tube, a light-pulse generator of He-Ne gas laser was developed and applied to a streak Mach-Zender interferometer using a rotating-drum camera. The results show that the high temperature flow thus produced is nicely separated from the driver gases and is comparatively uniform. It is expected that its applicability to experimental investigations of high temperature flow phenomena will be more promising than that of conventional shock tubes. M.M.

#### A66-35362 #

**POSSIBILITY OF THE USE OF GAS LASERS IN HIGH-PRECISION RANGE MEASUREMENTS [O VOZMOZHNOСТИ PRIMENENIIA GAZO-VYKH LAZEROV PRI VYSOKOTOCHNOM IZMERENII RASSTOIANII].**

V. V. Golosov, D. V. Gordeev, E. P. Ostapchenko, V. A. Perebinkin, and V. F. Khomaza.

*Geodeziia i Kartografiia*, May 1966, p. 9-15. In Russian.

Experimental assessment of an He-Ne laser as the source of light for light range finders. A laser used for this purpose should have (1) a small overall size and weight, (2) a radiation output power of at least 0.5 mw, an absence of difference frequencies in the range from 0 to 50 Mc, and the lowest possible beam divergence. V.Z.

#### A66-35368

**GAS LASER EXCITED IN THE PROCESS OF PHOTODISSOCIATION.**

T. L. Andreeva, V. A. Dudkin, V. I. Malyshev, G. V. Mikhailov, V. N. Sorokin, and L. A. Novikova (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(*Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, vol. 49, Nov. 1965, p. 1408-1410.)

*Soviet Physics - JETP*, vol. 22, May 1966, p. 969, 970. 6 refs.

Translation.

[For abstract see issue 06, page 892, Accession no. A66-16771]

#### A66-35370

**EFFECT OF INHOMOGENEITIES ON THE OPERATION REGIME OF SOLID-STATE LASERS.**

A. F. Suchkov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(*Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, vol. 49, Nov. 1965, p. 1495-1503.)

*Soviet Physics - JETP*, vol. 22, May 1966, p. 1026-1031. Translation.

[For abstract see issue 06, page 893, Accession no. A66-16773]

#### A66-35372

**AUTOMODULATION OF THE RADIATION FROM A LASER WITH A TWO-MODE RESONATOR.**

L. A. Ostrovskii (Gor'kovskii Gosudarstvennyi Universitet, Radio-fizicheskii Institut, Gorki, USSR).

(*Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, vol. 49, Nov. 1965, p. 1535-1543.)

*Soviet Physics - JETP*, vol. 22, May 1966, p. 1053-1058. 6 refs. Translation.

[For abstract see issue 06, page 893, Accession no. A66-16775]

#### A66-35379

**TRANSFER EFFICIENCY FORMULA FOR DIFFUSELY REFLECTING LASER PUMPING CAVITIES.**

J. Whittle and D. R. Skinner (Department of Supply, Australian Defence Scientific Service, Defence Standards Laboratories, Maribyrnong, Victoria, Australia).

*Applied Optics*, vol. 5, July 1966, p. 1179-1182.

A method is presented for estimating the transfer efficiency of laser pumping cavities that have diffusely reflecting walls. The method is based on the assumption that the light inside the cavity is approximately isotropic. It is demonstrated that such a simplification leads to estimates of transfer efficiency that agree well with estimates obtained by Monte Carlo methods. Curves are given for the proportion of isotropic light absorbed by a cylindrical absorbing crystal as a function of the product of radius and absorption coefficient. This proportion is an important parameter in the transfer efficiency estimation. (Author)

#### A66-35380

**FARADAY ROTATORS FOR HIGH POWER LASER CAVITIES.**

Nicholas George (California Institute of Technology, Pasadena, Calif.) and R. W. Waniek (Advanced Kinetics, Inc., Costa Mesa, Calif.).

*Applied Optics*, vol. 5, July 1966, p. 1183-1185. 8 refs. USAF-sponsored research.

The large values of Faraday rotation obtained with the use of pulsed high field magnets are shown to be applicable to the control of laser cavities. Experiments are described in which high-field magnets are operated up to 400 koe in order to introduce large rotations in short, highly transparent optical media. With a ruby laser, interesting pulse enhancement and periodic equispaced output is observed and related to the switching rate of the field, typically 20 koe/ $\mu$ sec. Used with a cryptocyanine shutter, it is found that either a single giant pulse or a well-spaced series of pulses can be obtained. These are synchronized with respect to the varying magnetic field with fractional microsecond accuracy. (Author)

**A66-35387****EFFECT OF HIGH-VELOCITY MIRROR TRANSLATION ON OPTICAL COHERENCE IN LASER INTERFEROMETERS.**

T. J. Burgess (California, University, Lawrence Radiation Laboratory, Livermore, Calif.).

*Applied Optics*, vol. 5, July 1966, p. 1239, 1240.

AEC-sponsored research.

Demonstration that high-velocity translation of one of the mirrors of a laser Michelson interferometer diminishes the coherence of the optical wave field. The mutual spectral density of the interfering beams is found to decrease due to Doppler displacement of the spectrum of the beam reflected from the moving mirror. Therefore, interference effects disappear as the mirror velocity increases.

B. B.

**A66-35388****ARGON BOMB PUMPING OF RUBY LASER.**

R. L. Conger, J. H. Johnson, L. T. Long, and J. A. Parks (U.S. Naval Ordnance Laboratory, Corona, Calif.).

*Applied Optics*, vol. 5, July 1966, p. 1240, 1241.

Description of a series of light energy measurements made with argon bombs constructed from 1.1- and 2.2-liter cylindrical cartons and used as chemically powered laser pumps. The most favorable geometry was found to occur with the 2.2-liter bombs; with a total charge of 200 g of Composition C-3, the light energy received by the glass rod was about 1.6 v  $\mu$ sec. A larger bomb test is discussed in which the facility consisted of PETN sheet explosive weighing about 6.82 kg lined the interiors of two pyramid-shaped boxes. This bomb produced a total light energy at the sampling rod of about 9 v  $\mu$ sec.

B. B.

**A66-35389****COMMENT ON THE EFFECT OF TRAPPED LIGHT ON THE OUTPUT OF A RUBY LASER.**

J. McKenna and J. G. Skinner (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

*Applied Optics*, vol. 5, July 1966, p. 1241, 1242. 8 refs.

Determination of the effect that a partially filled water jacket surrounding a ruby rod has on the pumping energy distribution inside the rod. A ruby disk with a 0.042% chromium concentration was edge-illuminated, and the fluorescent pattern from the circular face was photographed. The observed effect was to increase the pumping energy distribution within the outer region of the rod.

B. B.

**A66-35390****DETERMINATION OF SMALL WEDGE-ANGLES USING A GAS LASER.**

Viktor Met (Electro Optics Associates, Palo Alto, Calif.).

*Applied Optics*, vol. 5, July 1966, p. 1242-1244.

Use of a He-Ne gas laser for the direct display of optical relief maps. The laser is used as a nearly ideal point source, and suitable collimating optics render a beam of the required diameter of monochromatic, diffraction-limited, plane waves. The lines of constant optical thickness can then be viewed or photographed. The arrangement is found to render results fully equivalent to those obtained through other, more complex methods which use a complete Michelson interferometer with a laser source.

B. B.

**A66-35402****THE LASER AS A LIGHT SOURCE FOR ULTRAMICROSCOPY AND LIGHT SCATTERING BY IMPERFECTIONS IN CRYSTALS - INVESTIGATION OF IMPERFECTIONS IN LiF, MgO, AND RUBY.**

V. Vand, K. Vedam, and R. Stein (Pennsylvania State University, Materials Research Laboratory and College of Mineral Industries, Dept. of Geochemistry and Mineralogy, University Park, Pa.).

*Journal of Applied Physics*, vol. 37, June 1966, p. 2551-2557. 16 refs.

ARPA Contract No. SD-132; Contract No. AF 19(628)-5213.

A CW 1-mw He-Ne laser was used for the study of 90° light scattering in crystals in the arrangement of an ultramicroscope. Motorized translation of the illuminating objective allowed us to take photographs of extended sections through the crystal. When the laser was compared with light-scattering performance of an unfiltered unpolarized 100-watt mercury arc lamp it appeared to be appreciably more intense. On calibration, 880-Å latex particles suspended in water were easily visible by eye, and 3570-Å particles were photographed at 1/32-sec exposure. It is estimated that 1-hr exposures would make visible particles of some 300 Å eld (equivalent latex diameter) and with more powerful lasers, particles of about 100 Å eld could be theoretically reached. Lithium fluoride crystals of high purity show scattering defects concentrated at small-angle boundaries. Magnesium oxide crystals of lesser purity show many imperfections. Ruby laser crystals show imperfections at small-angle boundaries and also along lines perpendicular to the boundaries.

(Author)

**A66-35404****ORIENTATION EFFECT IN GaAs INJECTION LASERS.**

M. S. Abrahams and J. I. Pankove (Radio Corporation of America, RCA Laboratories, Princeton, N.J.).

*Journal of Applied Physics*, vol. 37, June 1966, p. 2596, 2597.

Research supported by the Radio Corporation of America; ARPA Contract No. SD-182.

An orientation effect was found with regard to the emission patterns observed on GaAs injection lasers. The emission in the [110] direction is considerably more uniform than that in the [110] direction. The beadedness observed on the (110) plane is believed to be due to linear low-resistivity regions parallel to [110]. These result from zinc decoration of the misfit dislocations parallel to [110]. The absence of zinc decoration on the [110] set of misfit dislocations can explain the absence of local bright spots and, thus, the more uniform emission in this direction.

(Author)

**A66-35418****MOMENTUM TRANSFER PRODUCED BY FOCUSED LASER GIANT PULSES.**

David W. Gregg and Scott J. Thomas (California, University, Lawrence Radiation Laboratory, Livermore, Calif.).

*Journal of Applied Physics*, vol. 37, June 1966, p. 2787-2789.

AEC-sponsored research.

The momentum transfer caused by focusing a laser "giant pulse" on a surface in a vacuum was studied. A simple pendulum was used for measuring the momentum. Data obtained for Be, C, Al, Zn, Ag, and W show the light intensity which gives maximum momentum transfer per unit of laser energy, and the decrease in momentum transfer as the light intensity is increased. The maximum shock pressures generated in the target materials were estimated to range from  $6 \times 10^5$  to  $10^6$  bars, depending on the material.

(Author)

**A66-35433****HIGH-POWER INFRARED LASER WITH ADJUSTABLE COUPLING-OUT.**

W. J. Witteman and G. V. D. Goot (Philips' Gloeilampenfabrieken, Philips Research Laboratories, Eindhoven, Netherlands).

*Journal of Applied Physics*, vol. 37, June 1966, p. 2919. 11 refs.

Description of laser action in a closed molecular system containing a mixture of carbon dioxide, nitrogen, and water vapor. An output of 20 watt and an energy conversion efficiency of 12% were reached. Particular attention is drawn to the reflectivity of the coupling-out plate, which made it possible to maximize the output during operation. Comment is made on the observed population inversion of the two lasing levels during the discharge with and without laser action.

F. R. L.

**A66-35434****GROWTH OF LARGE YTTRIUM VANADATE SINGLE CRYSTALS FOR OPTICAL MASER STUDIES.**

J. J. Rubin and L. G. Van Uitert (Bell Telephone Laboratories, Inc., Murray Hill, N. J.).

*Journal of Applied Physics*, vol. 37, June 1966, p. 2920, 2921.

7 refs.

Development of a process for preparing optical-quality crystals of vanadates doped with rare earth - e.g.,  $\text{YVO}_4:\text{Eu}$  phosphors. An oxyhydrogen furnace was employed as the primary heat source. The crucible is made of 0.060-in. Ir and is coated with zirconia on its external parts. It was found that flame-sprayed coatings of as little as 0.005-in. thickness greatly extend the useful lifetime of the crucible. The procedure for pulling  $\text{YVO}_4$  boules is described. Both A and C axis boules of  $\text{YVO}_4$  doped with trivalent rare-earth ions have been grown to diameters of 1/2 in. Because the predominant cleavage plane is normal to the A axis, C axis boules are preferred for ease of fabrication.

F. R. L.

**A66-35468****ATOMIC TIME STANDARDS.**

Leonard D. Berringer.

*Instruments and Control Systems*, vol. 39, June 1966, p. 99, 100.

Description of cesium beam standard, ammonia maser, and gas-cell type atomic clocks. A rubidium frequency source, cesium-beam frequency standard, Atomichron frequency standard, and hydrogen maser are described.

B. B.

**A66-35488****INTERSTELLAR VEHICLE PROPELLED BY TERRESTRIAL LASER BEAM.**

G. Marx (Budapest, University, Institute of Theoretical Physics, Budapest, Hungary).

*Nature*, vol. 211, July 2, 1966, p. 22, 23.

Proposal that a large, earth-based laser beam be used to propel a space vehicle on an interstellar trip. Although considered probably to be technically impossible for at least several decades, such an acceleration system could solve the problem of accelerating an interstellar vehicle. Deceleration at the end of the voyage remains a problem.

R. A. F.

**A66-35489****CO-OPERATIVE SCATTERING OF LASER LIGHT BY A THETA-TRON PLASMA.**

D. E. Evans, M. J. Forrest, and J. Katzenstein (United Kingdom Atomic Energy Authority, Atomic Energy Research Establishment, Culham Laboratory, Culham, Berks., England).

*Nature*, vol. 211, July 2, 1966, p. 23, 24. 6 refs.

Measurement of the distribution of light scattered into the electron feature by a plasma for the case when the ratio  $\alpha$  of the scale length for scattering to the plasma Debye length ranged from 1.2 to 1.5. The measurements are seen to be applicable as a plasma diagnostic technique.

R. A. F.

**A66-35531 #****LASER ILLUMINATED IMAGING.**

C. V. Smith, R. W. Wood, and N. D. Kay (Hughes Aircraft Co., Research and Development Div., Culver City, Calif.).

IN: NAECON/66; PROCEEDINGS OF THE ANNUAL NATIONAL AEROSPACE ELECTRONICS CONFERENCE, 18TH, DAYTON, OHIO, MAY 16-18, 1966. TECHNICAL PAPERS. [A66-35501 19-21]

Conference sponsored by the Dayton Section of the Institute of Electrical and Electronics Engineers.

Dayton, Ohio, Institute of Electrical and Electronics Engineers, 1966, p. 309-323. 14 refs.

Contract No. AF 33(615)-2005.

The feasibility of laser-illuminated electrooptical imaging has been demonstrated. The equipment used in these experiments and the results obtained are discussed, following a theoretical analysis of the energy requirements for imaging. As the analysis indicates, in some instances the required laser energy varies as the eighth power of range, keeping other parameters constant. The experimental equipment is built around a militarized orthicon television system, modified to increase sensitivity and to effectively range gate the orthicon. A ruby laser was used in both the normal and Q-spoiled modes, and the relative merits of the two are discussed. The experimental results, all obtained at night, include low-light television pictures, as well as laser-illuminated images to a range of 1 n mi. It will be observed that the laser illumination tends to enhance contrast, but does not always make objects more discernible. Photocathode resistivity was found to be a major concern in fast gated operation of the orthicon. A discussion of this problem and a simple but effective solution is included.

(Author)

**A66-35532 #****A MULTICOLOR LASER DISPLAY.**

C. M. Alsabrook (Texas Instruments, Inc., Apparatus Research and Development Laboratory, Dallas, Tex.).

IN: NAECON/66; PROCEEDINGS OF THE ANNUAL NATIONAL AEROSPACE ELECTRONICS CONFERENCE, 18TH, DAYTON, OHIO, MAY 16-18, 1966. TECHNICAL PAPERS. [A66-35501 19-21]

Conference sponsored by the Dayton Section of the Institute of Electrical and Electronics Engineers.

Dayton, Ohio, Institute of Electrical and Electronics Engineers, 1966, p. 325-331.

Description of a multicolor laser display in terms of overall optical and electronic considerations and study of the components that make up the display. The components described include lasers, a light modulator, and a horizontal and a vertical scanner. It is concluded that the multicolor laser display holds great promise to provide the next step in advancing display capabilities to a point that large-screen, real-time, color displays will be practical for all types of applications.

M. F.

**A66-35533 #****RING LASER SENSOR APPLICATIONS.**

D. Barnette and W. Macek (Sperry Rand Corp., Sperry Gyroscope Co., Electro-Optics Group, Great Neck, N. Y.).

IN: NAECON/66; PROCEEDINGS OF THE ANNUAL NATIONAL AEROSPACE ELECTRONICS CONFERENCE, 18TH, DAYTON, OHIO, MAY 16-18, 1966. TECHNICAL PAPERS. [A66-35501 19-21]

Conference sponsored by the Dayton Section of the Institute of Electrical and Electronics Engineers.

Dayton, Ohio, Institute of Electrical and Electronics Engineers, 1966, p. 333-339.

Research supported by the Sperry Rand Corp., USAF, and NASA.

Summary of the results of a preliminary comparison of achievable ring laser sensor parameters and characteristics with the requirements of a spectrum of applications involving the measurement of angular rate and mass flow. The indication of the competitive merits and shortcomings of the sensor thus obtained is then used to draw conclusions as to the most promising near-term applications. Two major functional applications of ring laser sensors, attitude reference applications and the functional extension - navigation and guidance - and rate stabilization, are studied. The characteristics of rate sensor, vehicle dynamics and mission are tabulated. Sensor parameter sensitivity to environment and to vehicle application are also tabulated.

M. F.

**A66-35592 #**

SPATIAL COHERENCE MEASUREMENT OF GAS LASER OUTPUT.  
R. Chwalko, S. Stepinski, and H. Hammer (Polska Akademia Nauk, Instytut Fizyki, Warsaw, Poland).

*Acta Physica Polonica*, vol. 29, June 1966, p. 753-757.

Experimental investigation of He-Ne laser coherent radiation having correlated phases of monochromatic radiation emitted at two different points. The equipment and procedure used in the experiments are described. The degree of coherence of the laser beam at two closely spaced twin pin-holes is determined and the results obtained are analyzed.

V. P

**A66-35666**

DEEP SPACE OPTICAL COMMUNICATION.

M. Kolker, E. Brookner, and R. Wilmotte (Raytheon Co., Sudbury, Mass.).

IN: NTC/66; PROCEEDINGS OF THE 1966 NATIONAL TELEMETERING CONFERENCE, BOSTON, MASS., MAY 10-12, 1966.

[A66-35661 19-07]

Conference sponsored by the Institute of Electrical and Electronics Engineers, the Instrument Society of America, and the American Institute of Aeronautics and Astronautics.

Bedford, Mass., Raytheon Co., 1966, p. 36-41. 9 refs.

System design concepts are described which suggest the laser's promise to compete with rf in fulfilling wide-band (e.g.,  $10^7$  bps), deep-space communication requirements. The advantages and problems in applying local heterodyne vs the proposed direct detection system (DDS) and transmitted reference system (TRS) with earth based large nondiffraction-limited optics and minimum size spacecraft optics are discussed. (Author)

**A66-35673**

A LASER DEVICE FOR REMOTE VIBRATION MEASUREMENT.

J. V. Foster (NASA, Ames Research Center, Moffett Field, Calif.).

IN: NTC/66; PROCEEDINGS OF THE 1966 NATIONAL TELEMETERING CONFERENCE, BOSTON, MASS., MAY 10-12, 1966.

[A66-35661 19-07]

Conference sponsored by the Institute of Electrical and Electronics Engineers, the Instrument Society of America, and the American Institute of Aeronautics and Astronautics.

Bedford, Mass., Raytheon Co., 1966, p. 74-76. 5 refs.

Contract No. NAS 2-3137.

Laboratory study of concepts that utilize a laser as a vibration measurement device. The measurement technique makes use of the Doppler shift produced on a wave reflected from a surface vibrating normal to the beam path. Several techniques are available for detecting the shift; optical heterodyne or homodyne detection, and microwave-subcarrier modulation methods are candidates for practical instruments. Preliminary results indicate that optical heterodyne detection is the most practical method with current equipment.

F. R. L.

**A66-35760**

A GALLIUM ARSENIDE ELECTRON BEAM INJECTION LASER.

N. G. Basov, O. V. Bogdankevich, and B. M. Lavrushin (Akademii Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(*Fizika Tverdogo Tela*, vol. 8, Jan. 1966, p. 21-23.)

*Soviet Physics - Solid State*, vol. 8, July 1966, p. 15-17. 7 refs.

Translation.

[For abstract see issue 10, page 1544, Accession no. A66-22146]

**A66-35788**

ELECTRON-BOMBARDMENT-INDUCED STIMULATED EMISSION FROM CADMIUM SELENIDE.

E. L. Nolle, V. S. Vavilov, G. P. Golubev, and V. S. Mashtakov (Akademii Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(*Fizika Tverdogo Tela*, vol. 8, Jan. 1966, p. 286, 287.)

*Soviet Physics - Solid State*, vol. 8, July 1966, p. 236, 237.

Translation.

[For abstract see issue 10, page 1544, Accession no. A66-22174]

**A66-35798**

PRACTICAL USES OF LASERS.

W. T. Gunston.

*Science Journal*, vol. 2, June 1966, p. 32-43.

Survey of the uses which have been found for lasers in the six years since their introduction. It is found that practical applications of lasers are increasing rapidly, and about 100 of them are outlined.

R. A. F.

**A66-35810**

HIGH TEMPERATURE ALUMINA DISCHARGE TUBE FOR PULSED METAL VAPOR LASERS.

M. Piltch and G. Gould (TRG, Inc., Melville, N. Y.).

*Review of Scientific Instruments*, vol. 37, July 1966, p. 925-927. 9 refs.

Contract No. AF 49(638)-1535.

Description of an alumina high-temperature gas discharge tube with cold windows constructed for the investigation of metallic vapor lasers. It offers vacuum-tight containment to 1400°C and flexibility with respect to active material, discharge diameter, type of excitation, and output windows. Pulsed laser oscillations in lead, manganese, and copper have been observed in this apparatus.

M. M.

**A66-35813**

METHOD FOR DECOUPLING LASER MIRROR TRANSDUCERS FROM MECHANICAL RESONANCES OF LASER CAVITY.

A. D. White (Bell Telephone Laboratories, Inc., Murray Hill, N. J.).

*Review of Scientific Instruments*, vol. 37, July 1966, p. 976, 977.

Description of a decoupling technique for laser mirror transducers which should be applicable to most laser cavities where coupling is likely to be a problem. Basically, the technique involves mounting the mirror-transducer assembly at its nodal plane. As the driving frequency approaches resonance, the location of the nodal plane shifts, except in the special case of a completely symmetric structure for which the nodal plane is the midplane. Preliminary experiments with an asymmetrical transducer confirmed the feasibility of the approach. The experiment consisted of monitoring the acceleration at one end of a cavity while driving a decoupled transducer mounted at the other end. Coupling to all cavity resonances up to ~17 kc was reduced by a factor of 4 or more with the exception of an anomalous resonance at ~12 kc which was unaffected.

M. M.

**A66-35817 #**

PLASMA INTERFEROMETRY USING A LASER [INTERFEROMETRIIA PLAZMI ZA DOPOMOGOIU OPTICHNOGO KVANTOVOGO GENERATORA].

I. Iu. Adamov, L. O. Dushin, and O. S. Pavlichenko (Akademii Nauk Ukrain's'koi RSR, Fiziko-Tekhnichnii Institut, Kharkov, Ukrainian SSR).

*Ukrains'kii Fizichnii Zhurnal*, vol. 11, June 1966, p. 615-618. In Ukrainian.

Discussion of plasma diagnostics with the use of a laser-based continuous-action interferometer. The phase shift of a laser signal after the passage through the plasma is interpreted as the time-dependent laser frequency variation  $\Delta\omega = d\varphi/dt$ . Frequency detection, followed by integration of the obtained signal, permits a plasma density determination, since  $\Delta\omega \sim dN/dt$ . The method is effective in measuring plasma density variations from  $10^{12}$  to  $10^{16}$  cm<sup>-3</sup>/μsec for a laser wavelength of 3 μ and a plasma column length of 5 cm.

V. Z.

**A66-36005**

EFFECTS OF ATOMIC DEGENERACY AND CAVITY ANISOTROPY ON THE BEHAVIOR OF A GAS LASER.

Walter M. Doyle and Matthew B. White (Philco Corp., Aeronutronic Div., Newport Beach, Calif.).

*Physical Review, 2nd Series*, vol. 147, July 8, 1966, p. 359-367. 7 refs.

Expressions are developed in this paper which describe the behavior of a gas laser having generalized polarization characteristics. It is found that degeneracies of the atomic energy levels

play an important part in determining the behavior of such a laser since significant terms occur in the nonlinear polarization which are attributable to an oscillatory mixing of these levels. As a result, it is found, for example, that for single-mode operation the field intensity is greatest for either plane or circular polarization depending upon whether a  $\Delta j = \pm 1$  or  $\Delta j = 0$  atomic transition is involved in the laser action. For two-mode operation, on the other hand, the behavior depends in a complicated way both on the polarization states of the oscillations and on the degree of degeneracy of the energy levels. This behavior is discussed in a number of special cases. (Author)

#### A66-36008

##### QUANTUM THEORY OF A LASER MODEL.

Charles R. Willis (Boston University, Boston, Mass.).

Physical Review, 2nd Series, vol. 147, July 8, 1966, p. 406-414. 8 refs.

USAF-sponsored research.

We derive the kinetic equations for the coupled single-particle density matrix  $\rho$  and the electromagnetic density matrix  $R$  to lowest order in the dimensionless coupling constant  $\beta^2 = (\omega_L / \omega_D)^2$ . The laser frequency  $\omega_L$  is  $(4\pi)^{-1/2} (\pi r_0 \lambda^2)^{1/2} \omega_0$  where  $\pi$  is the number of two-level systems per unit volume,  $r_0$  is the classical electron radius,  $\lambda$  is the wavelength of the radiation, and  $k\omega_0$  is the two-level energy difference. The Doppler frequency  $\omega_D$  characterizes the center-of-mass motion. For gas lasers  $\beta^2$  is much less than 1 and, consequently, we generalize and use the Bogoliubov derivation of kinetic equations for weak interactions. We find solutions when the average field vanishes and which include spontaneous emission correctly. The single-particle density matrix and the radiation density matrix are coupled through their second moments. When we substitute the solution of the second-moment equations into the density-matrix equations, we find that each density matrix satisfies an uncoupled linear equation with known time-dependent coefficients. We introduce and discuss dissipation from the density-matrix point of view. With the use of the density-matrix formalism we indicate that the correct expansion parameter for higher order kinetic equations is  $\beta^2$ . (Author)

#### A66-36034

##### DISCIPLINE YOUR LASER WITH AN OUTPUT-ENERGY CONTROLLER.

Herbert Gresser (TRG, Inc., Melville, N. Y.).

Microwaves, vol. 5, July 1966, p. 50-53.

Description of a device known as a laser output-energy controller (LOC) which enables an eight-to-one improvement in pulse-to-pulse repeatability to be achieved. This device can be used to optimize the trade-off between lost efficiency and repeatable pulses; the controller operates by siphoning a small known percentage of the laser's output into a feedback network. A small sample of the output pulse is directed into a photodiode assembly, passed to a buffer amplifier, and then to an integrator. The peak value of the waveform at the integrator output is proportional to the total energy of the laser's output pulse. This pulse provides an almost direct short circuit across the laser capacitors and pump lamp by causing the firing of an ignitron. Some applications for this device are listed and the benefits of control are enumerated. D. P. F.

#### A66-36036

##### DETERMINATION OF VALENCE BAND SPIN-ORBIT INTERACTION IN HIGHLY DEGENERATE SEMICONDUCTORS FROM MAGNETO-OPTICAL LASER EMISSION STUDIES.

A. N. Chakravarti (Calcutta, University, University College of Technology, Institute of Radio Physics and Electronics, Calcutta, India).

Indian Journal of Pure and Applied Physics, vol. 4, Apr. 1966, p. 173, 174. 12 refs.

Demonstration of the possibility of accurately determining the spin-orbit splitting of the valence band in highly degenerate semiconductors from the observed splitting of peak laser diode emission in high magnetic fields. Numerical values of such valence band splittings were computed for InAs and InSb. An estimate was also

made of the approximate magnetic field required for obtaining peak emission splitting in GaAs laser diodes, for which no such observation has yet been reported. M. M.

#### A66-36051

##### LASER TECHNIQUE FOR POOR WEATHER LANDINGS. II [LASER-TECHNIK FÜR SCHLECHTWEETTERLANDUNG. II].

Edgar Rössger.

Flugwelt, vol. 18, July 1966, p. 555-557. 15 refs. In German.

Discussion of the negative effect of atmospheric aerosols on the performance of aircraft all-weather landing guidance systems employing lasers. A formula is derived for the total-reflection coefficient that measures the attenuating effect of the atmosphere on radiation. V. Z.

#### A66-36060

##### LASER RECEIVERS.

Monte Ross (McDonnell Aircraft Corp., Space and Missile Div., Advanced Electronic Techniques Dept., St. Louis, Mo.). New York, John Wiley and Sons, Inc., 1966. 405 p. \$14.95.

The primary purpose of this book is to present a broad picture of the fundamentals of laser receivers from the necessary and available components and theoretical foundations to the system concepts and considerations. Laser receiver noise performance, modulation that puts the information on the laser beam, atmospheric effects on the laser beam, the techniques of detection, and the evaluation of detectors are considered. Also included are the physical principles involved, the experimental and useful hardware of today, and the directions in which all of these techniques are likely to develop in the future. Optical communication in the visible and near-IR spectrum, active and passive IR systems, laser radar applications, and a variety of more or less successful experimental systems are also described, evaluated and explained. M. F.

#### A66-36066

##### RESONANT BIREFRINGENCE IN THE ELECTRIC FIELD OF A LIGHT WAVE.

A. M. Bonch-Bruевич, N. N. Kostin, and V. A. Khodovoi. (ZHETF Pis'ma v Redaktsiiu, vol. 3, June 1, 1966, p. 425-429.) JETP Letters, vol. 3, June 1, 1966, p. 279-281. Translation.

Observation of birefringence in potassium vapor under the influence of the electric field of ruby-laser emission. The laser emission intensity required to obtain a signal of prescribed magnitude is found to depend linearly on the wavelength difference between the resonant transition and the laser emission. It is concluded that the resonant transition  $4P_{3/2} - 6S_{1/2}$  makes the main contribution to the level splitting of the  $4P_{3/2}$  state of potassium under the influence of the ruby laser emission. A. B. K.

#### A66-36070

##### GALLIUM ARSENIDE LASER OPERATING AT ROOM TEMPERATURE.

N. G. Basov, Iu. P. Zakharov, T. F. Nikitina, Iu. M. Pópov, G. M. Strakhovskii, V. M. Tatarenkov, and A. N. Khvoshech (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR). (ZHETF Pis'ma v Redaktsiiu, vol. 3, June 1, 1966, p. 441-443.) JETP Letters, vol. 3, June 1, 1966, p. 289-291. Translation.

Investigation of GaAs lasers based on diffusion p-n junctions operating at 300°K. The diode emission at low currents is found to have a broad spectrum, which narrows down gradually from 300 to 110 Å with increasing current. At a threshold density, varying from diode to diode between  $1 \times 10^5$  and  $5 \times 10^5$  amp/cm<sup>2</sup>, a single generation line is produced at a wavelength of about 9000 Å. With a further increase in the current several lines corresponding to various oscillation modes in the resonator appear in the emission spectrum. A. B. K.

**A66-36075**

LIQUID IMMERSION FOR REDUCING DAMAGING EFFECT OF LASER GIANT PULSES TO DIELECTRIC MIRROR COATINGS. David W. Gregg and Scott J. Thomas (California, University, Lawrence Radiation Laboratory, Livermore, Calif.).

Applied Physics Letters, vol. 8, June 15, 1966, p. 316-318. AEC-sponsored research.

Study of the effect of liquid immersion on the resistance of dielectric mirror coatings to damage by laser giant pulses. It is found that when such coatings are immersed in a nitrobenzene solution containing a small amount of vanadium phthalocyanine their resistance to damage when exposed to ruby laser giant pulses is greatly increased. Both hard coatings, consisting of alternate layers of silicon oxide and titanium oxide, and soft, water-soluble coatings, consisting of alternate layers of zinc sulfide and thorium oxyfluoride, are investigated. It is found that giant pulse intensities which caused total destruction of unimmersed coatings in 1 to 5 pulses caused little damage to the same coatings immersed, even when exposed to more than 50 pulses.

A. B. K.

**A66-36076**

LASER ACTION IN SINGLY IONIZED Ge, Sn, Pb, In, Cd AND Zn. W. T. Silvast, G. R. Fowles, and B. D. Hopkins (Utah, University, Dept. of Physics, Salt Lake City, Utah).

Applied Physics Letters, vol. 8, June 15, 1966, p. 318, 319. NSF-supported research.

Observation of pulsed laser action in the visible spectrum of singly ionized Ge, Sn, Pb, In, Cd, and Zn in the wavelength range from 3900 Å to 8000 Å. The temperature range and corresponding pressure range at which laser action occurred for each transition are listed in tabular form. The new laser transitions in Cd and Zn are attributed to the use of a longer effective tube length than previously used.

A. B. K.

**A66-36079**

A FARADAY-SWITCHED RUBY LASER.

U. Ascoli-Bartoli, G. Benedetti-Michelangeli, and L. Lovisetto (EURATOM and Comitato Nazionale per l'Energia Nucleare, Laboratorio Gas Ionizzati, Frascati, Italy).

Applied Physics Letters, vol. 8, June 15, 1966, p. 332, 333.

Description of the operation of a Q-switching device, based on the Faraday effect and used with a water-clad 3-in. ruby laser, applicable to the field of plasma diagnostics where a laser free of all collateral phenomena is required. The conventional Kerr cell is substituted by a strain-free rod of glass 10-cm long; during the optical pumping a quasi-static magnetic field is applied. The field intensity (4000 gauss) is chosen in such a way that the plane of polarization of a photon, emitted by the ruby is rotated through 45° before being reflected by a mirror. When traveling back to the ruby it is again rotated by an additional 45° in such a way that the laser action is extinguished. Once the pumping is completed the high Q of the cavity is restored by superposing a -45° rotation. The delay between operating the Faraday shutter and the start of the light pulse was about 100 nsec.

D. P. F.

**A66-36080**

OCS MOLECULAR LASER.

Thomas F. Deutsch (Raytheon Co., Research Div., Waltham, Mass.).

Applied Physics Letters, vol. 8, June 15, 1966, p. 334, 335, 7 refs. Army-supported research.

Observation of laser action in pulsed discharges of both pure OCS and OCS-N<sub>2</sub>, OCS-He, OCS-CO, and OCS-CO-He mixes. A water-cooled laser tube with a 32-mm ID and a length of 2 m was used. The optics consisted of a 25-m radius gold-coated mirror at one end and a flat mirror with 1-mm diameter coupling hole at the other. Pressures ranged from 0.3 to 6.0 torr, depending on the gas used; current pulses nominally 1-μsec wide with peak amplitudes up to 70 amp were applied at a rate of 16 pulses/sec. Wavelength measurements were made with a 0.5 m Jarrell-Ash spectrometer. The CO laser transitions observed and identified in an OCS-He discharge are listed in a table. The experimental

results are analyzed in terms of the first-excited vibrational state of CO which explains the manner with which energy can be transferred to the 00<sup>0</sup>1 level of OCS by nearly resonant vibration-vibration collisions.

D. P. F.

**A66-36081**

LASER PROPERTIES OF A VAPOR-GROWN RUBY.

J. R. O'Connor (Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.), P. S. Schaffer (Lexington Laboratories, Inc., Cambridge, Mass.), and R. A. Bradbury (USAF, Office of Aerospace Research, Cambridge Research Laboratories, Bedford, Mass.).

Applied Physics Letters, vol. 8, June 15, 1966, p. 336, 337.

Description of some preliminary measurements on the physical and laser properties of vapor-grown ruby single crystals. The reaction for the production of the aluminum oxide was based on the combination of aluminum chloride, carbon monoxide, and hydrogen gas - hydrochloric acid and carbon monoxide being produced as byproducts. Substituting a given fraction of the aluminum salt by chromium chloride gives the ruby crystals, prepared by epitaxial growth on a single-crystal substrate. The unannealed ruby laser crystal was 4 mm in diameter and 25-mm long, with the c axis at an angle of 32° to the rod axis. The laser emissions and laser properties of the crystals were compared with those of other commercial crystals and this method of crystal growing was found satisfactory in terms of performance.

D. P. F.

**A66-36255**

EXPERIMENTAL STUDY OF THE IONIZATION OF GASES BY A VERY INTENSE LIGHT BEAM - MEASUREMENT OF THE ENERGY ABSORPTION IN THE IONIZED ZONE [ETUDE EXPERIMENTALE DE L'IONISATION DES GAZ PAR UN FAISCEAU LUMINEUX TRES INTENSE - MESURE DE L'ABSORPTION DE L'ENERGIE DANS LA ZONE IONISEE].

Jean-Claude Fecan, Francis Floux, and Pierre Veyrie (Commissariat à l'Energie Atomique, Centre d'Etudes de Limeil, Service Documentation, Villeneuve-Saint-Georges, Seine-et-Oise, France). Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques, vol. 262, no. 25, June 20, 1966, p. 1613-1616. In French.

Experimental study of the transmission of a luminous flux by means of a high-power laser and of the energy absorbed by the plasma. Graphs of the pulses observed after the plasma discharge are plotted for deuterium, argon, and helium. It is shown that the sudden rise appearing at the end of a pulse on the power curves disappears when expansion of the plasma toward the concentration optic is taken into account.

A. B. K.

**A66-36262**

LIGHT MODULATION BY ELECTRICAL BIREFRINGENCE - APPLICATION TO TELECOMMUNICATIONS [MODULATION DE LA LUMIERE PAR BIREFRINGENCE ELECTRIQUE - APPLICATION A UX TELECOMMUNICATIONS].

J. Le Mézec, J. Henaff, and Nguyen Ngoc Chau (Centre National d'Etudes des Télécommunications, Département Pièces Détachées - Tubes, Issy-les-Moulineaux, Seine, France).

L'Onde Electrique, vol. 46, May 1966, p. 515-545, 41 refs. In French.

Review of the problems concerning the modulation of laser light by either the Pockels or Kerr effect for application to telecommunications systems. Also described is how several types of optical modulators and demodulators were adapted to a neon-helium gas laser. Optical phenomena in anisotropic media, electrical birefringence, and various types of modulating devices are described. It is found that the power requirements for 100% amplitude modulation are of the order of 2 watts/Mc for wide bandpass. The characteristics of a complete set of transmitting equipment are considered, and it is shown that the SNR in such devices is rather poor as compared with radio communications equipment.

D. P. F.

**A66-36263****LIGHT EMISSION IN SEMICONDUCTORS [EMISSION DE LUMIERE DANS LES SEMICONDUCTEURS].**

R. Eymard (Centre National d'Etudes des Télécommunications, Issy-les-Moulineaux, Seine, France).

(Société Française des Electroniciens et des Radioélectriciens, Conférence sur l'Optoélectronique et les Semiconducteurs, Jan. 26, 1966, Lecture.)

*L'Onde Electrique*, vol. 46, May 1966, p. 548-551. In French.

Study of the mechanisms of semiconductor light emission, wavelength emitted, width of ray emitted, and particularly the efficiency of the emission. Absorption and emission phenomena of light are analyzed in terms of their applicability to semiconductor light emission. The overall efficiency of spontaneously emitted light and stimulated emission are compared and discussed. Homogeneity requirements in the emitting material and their effect in obtaining uniform sources of light are investigated. D.P.F.

**A66-36265****GENERATOR OF COHERENT LIGHT WITH ADJUSTABLE FREQUENCY [GENÉRATEURS DE LUMIERE COHERENTE A FREQUENCE REGLABLE].**

B. de Cremoux (Compagnie Générale de Télégraphie sans Fil-CEPCA, Paris, France).

(Société Française des Electroniciens et des Radioélectriciens, Conférence sur l'Optoélectronique et les Semiconducteurs, Jan. 26, 1966, Lecture.)

*L'Onde Electrique*, vol. 46, May 1966, p. 557-560. 14 refs. In French.

Research supported by the Direction des Recherches et Moyens d'Essais.

Discussion of devices capable of producing coherent laser-type light emission in which the frequency of the emitted radiation can be varied over the visible spectrum down to wavelengths of some tenths of a micron. The procedure for varying the wavelength of the light emitted is based on simultaneous variations in the cavity modes of oscillations and in the position of the maxima on the gain curves. The effect of a magnetic field on variable-frequency lasers is examined, and it is seen that the observable frequency displacements cannot as yet be adequately explained satisfactorily in terms of current laser theory. D.P.F.

**A66-36266****INFRARED LIGHT PROJECTORS [PROJECTEURS DE LUMIERE INFRAROUGE].**

J. C. Bedier (La Radiotechnique - COPRIM, Caen, France).

(Société Française des Electroniciens et des Radioélectriciens, Conférence sur l'Optoélectronique et les Semiconducteurs, Jan. 26, 1966, Lecture.)

*L'Onde Electrique*, vol. 46, May 1966, p. 561-564. In French. Research supported by the Direction des Recherches et Moyens d'Essais.

Investigation of the possibilities of replacing a heated tungsten filament and IR filter in the 1.5 to 10  $\mu$  range by a GaAs electroluminescent diode without a filter for commercial applications in IR illumination. It is shown that the intensity of the light emitted by the diode, of the order of 5 watts/cm<sup>2</sup>-sr, is comparable to the 30 watts/cm<sup>2</sup>-sr given off by the tungsten filament heated to 2000°K after the losses introduced by the filter are considered. The procedures to be used in evaluating the parameters which determine the efficiency of the emission at relatively high intensities of current are determined. D.P.F.

**A66-36268****SEMICONDUCTOR LASERS AND FAST DETECTORS IN THE MIDDLE IR [LASERS A SEMICONDUCTEURS ET DETECTEURS RAPIDES DANS L'INFRAROUGE MOYEN].**

M. Rodot (Centre National de la Recherche Scientifique, Laboratoire de Magnétisme et de Physique du Solide, Bellevue, Seine-et-Oise, France) and J. Besson (Société Anonyme des Télécommunications, Paris, France).

(Société Française des Electroniciens et des Radioélectriciens, Conférence sur l'Optoélectronique et les Semiconducteurs, Jan. 26, 1966, Lecture.)

*L'Onde Electrique*, vol. 46, May 1966, p. 569, 570. 13 refs. In French.

Study of InAs lasers and HgTe-CdTe photodetectors with very fast time constants (of the order of 60 nsec) for the 10- $\mu$  IR spectral band. An InAs laser with a power output of 20 mw for an excitation of 5 amp is described; directivity of the emitted light is good (a solid angle of about 4°) and the single mode spectrum lies in the 3.1  $\mu$  range. Diffusion-evaporation techniques in an isothermal regime are discussed in connection with the preparation of HgTe-CdTe junctions for light detectors with a maximum response in the 3- $\mu$  range. D.P.F.

**A66-36595 #****THE HOT-ICE EXPERIMENT.**

U. Ascoli-Bartoli, C. de Michelis, and E. Mazzucato (EURATOM and Comitato Nazionale per l'Energia Nucleare, Laboratorio Gas Ionizzati, Frascati, Italy).

IN: PLASMA PHYSICS AND CONTROLLED NUCLEAR FUSION RESEARCH; INTERNATIONAL ATOMIC ENERGY AGENCY, CONFERENCE, 2ND, CULHAM, BERKS., ENGLAND, SEPTEMBER 6-10, 1965, PROCEEDINGS. VOLUME 2. [A66-36539 19-25] Vienna, International Atomic Energy Agency, 1966, p. 941-951; Discussion, T. Consoli (Commissariat à l'Energie Atomique, Centre d'Etudes Nucleaires de Saclay, Saclay, Seine-et-Oise, France), H. C. Van Bueren, and B. A. Tozer, p. 951.

Description of the production of plasma by firing a giant-pulse laser at a solid deuterium pellet. Time-resolved scattering of light and schlieren photography combined with time-of-flight measurements indicate a strong anisotropy in the plasma outburst. B.B.

**A66-36596 #****PLASMAS FOR THERMONUCLEAR RESEARCH PRODUCED BY LASER BEAM IRRADIATION OF SINGLE SOLID PARTICLES.**

A. F. Haught and D. H. Polk (United Aircraft Corp., Research Laboratories, East Hartford, Conn.).

IN: PLASMA PHYSICS AND CONTROLLED NUCLEAR FUSION RESEARCH; INTERNATIONAL ATOMIC ENERGY AGENCY, CONFERENCE, 2ND, CULHAM, BERKS., ENGLAND, SEPTEMBER 6-10, 1965, PROCEEDINGS. VOLUME 2. [A66-36539 19-25] Vienna, International Atomic Energy Agency, 1966, p. 953-967; Discussion, p. 967, 968. 15 refs.

A ruby laser was used to form a high-temperature, high-density plasma from a single, solid particle of lithium hydride suspended in a vacuum. The 10- to 50- $\mu$ -diam particle was charged by an electron beam and suspended in a vacuum in the electric field produced by a cubical array of electrodes of which opposite pairs were connected to the terminals of a Y-connected, three-phase alternating current supply. The focused 20-nsec, 30-Mw giant-pulse beam from a Q-spoiled ruby laser irradiated the suspended particle and produced an extremely high-density, high-temperature plasma. Charge collection measurements showed that complete single ionization of the 10<sup>15</sup> atoms in the lithium hydride was achieved in the plasmas produced. Time-of-flight studies of the expanding plasma yield initial plasma temperatures of 10 to 100 ev. Since the ionization was produced in a vacuum, there was no collisional cooling of this high-energy plasma. The plasmas had a uniform radial expansion, high densities and temperatures, and zero net currents within the plasma - a set of properties which make them particularly interesting from plasma confinement studies and controlled thermonuclear investigations. Further studies of these laser-irradiated, single particle plasmas are in progress and include flux coil measurements of the expanding plasma in a magnetic field, spectroscopic determination of ion excited temperatures, examination of the scattering and absorption of the incident laser beam by the plasma, and measurements of the containment lifetime of these unusual plasmas in magnetic confinement fields. (Author)



**A66-36719****FAST OVERLAP OF MICROWAVE RADIATION BY AN IONIZATION AUREOLE OF A SPARK IN A LASER BEAM.**

G. A. Askarian, M. S. Rabinovich, M. M. Savchenko, and V. K. Stepanov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(ZHETF Pis'ma v Redaktsiiu, vol. 3, June 15, 1966, p. 465-468.)  
JETP Letters, vol. 3, June 15, 1966, p. 303-305. Translation.

Investigations of a fast photoionization aureole from a light spark in a laser beam, carried out in a range of tens and hundreds of nanoseconds. The ionization results from a flash of ionizing radiation that leads the shock wave from the spark. Typical oscillograms are shown of an overlap signal with a rise time of 30 nsec and a 45° backward reflection signal from a spark in air. B. B.

**A66-36720****TWO-CAVITY LASER AS HIGH-RESOLUTION SPECTROSCOPE.**

N. G. Basov, A. N. Oraevskii, G. M. Strakhovskii, and A. V. Uspenskii (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(ZHETF Pis'ma v Redaktsiiu, vol. 3, June 15, 1966, p. 468-471.)  
JETP Letters, vol. 3, June 15, 1966, p. 305, 306. Translation.

Demonstration that in a laser it is possible to resolve spectral components within the limits of a homogeneously broadened line, so that the resolution limit of such a spectroscopy is apparently determined by the width associated with the monochromaticity and stability of the radiation source. To resolve the components within the homogeneously broadened spectral line, a laser with two cavities in tandem is used. B. B.

**A66-36721****MULTIPHOTON IONIZATION OF KRYPTON AND ARGON BY RUBY LASER RADIATION.**

G. S. Voronov, G. A. Delone, and N. B. Delone (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(ZHETF Pis'ma v Redaktsiiu, vol. 3, June 15, 1966, p. 480-483.)  
JETP Letters, vol. 3, June 15, 1966, p. 313-315. 8 refs. Translation.

Observation of multiphoton ionization of krypton and argon atoms by ruby-laser radiation at an electric field intensity of  $\sim 10^7$  v/cm. The ratios of the ionization potentials to the quantum energy show that the ionization can occur by absorption of eight and nine quanta respectively. For the same photon flux, the ratios of the ion signals of krypton, argon, and xenon were measured. B. B.

**A66-36929****SOME CURRENT VIEWS ON HOLOGRAPHY.**

Robert J. Collier (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

IEEE Spectrum, vol. 3, July 1966, p. 67-74. 22 refs.

Description of the general principles and current research work in holography, the producing of images by means of wavefront reconstruction using laser coherent light sources. The basic holography equations are reviewed, and the forming of Fourier transform holograms is discussed. The principles involved in the formation of multicolor hologram images are described. Several holograms are presented, along with diagrams of the experimental configurations, and hologram interferometry is briefly examined. M. L.

**A66-36930****OPTICAL COMMUNICATIONS IN THE EARTH'S ATMOSPHERE.**

Bernard Cooper (International Telephone and Telegraph Corp., ITT Federal Laboratories Div., Space Communication Laboratory, Advanced Systems Analysis Section, Nutley, N.J.).

IEEE Spectrum, vol. 3, July 1966, p. 83-88. 11 refs.

Review of the use of coherent laser light in atmospheric communications systems. The coherence property of an electromagnetic wave is considered as the ability of the wave to interfere with itself, which is related to the degree of determinism associated with the wavefront - or the degree of correlation between various

points on the wave. Two major advantages of such radiation are discussed: the ability to concentrate energy at great distances (minimal beam divergence) and spectral selectivity. Noise considerations, coherent detection efficiency, and atmospheric effect are considered. Earthbound communications applications are severely limited because of (1) the effect of atmospheric turbulence on the coherence of the radiation, and (2) the effect of small vibrations on the coherent detection efficiency and SNR. However, for space applications - e.g., between an earth-orbiting relay and a Mars space probe - such communications systems should be quite suitable. M. L.

**A66-36938****APPARENT ILLUMINANCE AS A FUNCTION OF RANGE IN GATED, LASER NIGHT-VIEWING SYSTEMS.**

Lester F. Gillespie (U.S. Army, Night Vision Program Project Office, Night Vision and Target Acquisition Laboratories, Night Vision Laboratory, Fort Belvoir, Va.).

Optical Society of America, Journal, vol. 56, July 1966, p. 883-887.

Gated, laser night-viewing systems are briefly described, and a method of calculation is presented for determining apparent illuminance as a function of target distance. A general equation for gated viewing system is developed,  $L(x) = \int_0^x I(x, ct) \cdot Y(x, ct) dt$ , where  $L(x)$  is apparent illuminance,  $I(x, ct)$  is illuminance as a function of time, and  $Y(x, ct)$  is optical transmittance of a shutter. Its practical use is discussed and illustrated, and it is shown that optimum performance is achieved by using a light pulse of duration equal to the shutter open period. Methods are outlined for calculation of integrated beam backscatter. Variations in the apparent illuminance profile for various laser pulse shapes and shutter transmittance functions are discussed. Several specific cases, including one highly practical case apt to occur in actual systems, are treated quantitatively. (Author)

**A66-36967****LASERS. VOLUME 1.**

Edited by A. K. Levine (General Telephone and Electronics Laboratories, Inc., Bayside, N.Y.).

New York, Marcel Dekker, Inc., 1966. 365 p.  
\$14.50.

**CONTENTS:**

INTRODUCTION TO THE SERIES. A. K. Levine (General Telephone and Electronics Laboratories, Inc., Bayside, N.Y.), p. v, vi.

PULSED RUBY LASERS. V. Evtuhov and J. K. Neeland (Hughes Aircraft Co., Malibu, Calif.), p. 1-136. 278 refs. [See A66-36968 20-16]

OPTICALLY PUMPED PULSED CRYSTAL LASERS OTHER THAN RUBY. L. F. Johnson (Bell Telephone Laboratories, Inc., Murray Hill, N.J.), p. 137-180. 92 refs. [See A66-36969 20-16]

ORGANIC LASER SYSTEMS. A. Lempicki and H. Samelson (General Telephone and Electronics Laboratories, Inc., Bayside, N.Y.), p. 181-252. 109 refs. [See A66-36970 20-16]

Q MODULATION OF LASERS. R. W. Hellwarth (Hughes Aircraft Co., Malibu, Calif.), p. 253-294. 56 refs. [See A66-36971 20-16]

MODES IN OPTICAL RESONATORS. Herwig Kogelnik (Bell Telephone Laboratories, Inc., Murray Hill, N.J.), p. 295-347. 214 refs. [See A66-36972 20-23]

AUTHOR INDEX, p. 349-360.

SUBJECT INDEX, p. 361-365.

**A66-36968****PULSED RUBY LASERS.**

V. Evtuhov and J. K. Neeland (Hughes Aircraft Co., Research Laboratories, Malibu, Calif.).

IN: LASERS. VOLUME 1.

Edited by A. K. Levine.  
New York, Marcel Dekker, Inc., 1966, p. 1-136. 278 refs.  
USAF-supported research.

Account of the inception and development of pulsed ruby lasers. The background and first observations of laser action and the properties of ruby as a laser material are appraised. The pumping of ruby crystals and threshold considerations, and output characteristics of pulsed ruby lasers are investigated. Quantum mechanical considerations of the details of laser action in ruby are examined, and variations on the basic device are discussed. B.B.

#### A66-36969

##### OPTICALLY PUMPED PULSED CRYSTAL LASERS OTHER THAN RUBY.

L. F. Johnson (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

IN: LASERS. VOLUME 1.

Edited by A. K. Levine.

New York, Marcel Dekker, Inc., 1966, p. 137-180. 92 refs.

Investigation of the fluorescence of rare-earth, actinide, and transition-metal ions in insulating crystals as a result of optical excitation and the luminescence characteristics of semiconductors excited by electrical injection. The spectroscopic properties of the active ions in these materials are given, the operating characteristics of these systems under pulse illumination are discussed, and some current areas of research and related problems are mentioned. B.B.

#### A66-36970

##### ORGANIC LASER SYSTEMS.

A. Lempicki and H. Samelson (General Telephone and Electronics Laboratories, Inc., Bayside, N.Y.).

IN: LASERS. VOLUME 1.

Edited by A. K. Levine.

New York, Marcel Dekker, Inc., 1966, p. 181-252. 109 refs.

Review of organic laser systems and examination of the general features of organic luminescence relating to laser requirements. The luminescence of organic compounds and the general conditions for achieving laser action are investigated. Fluorescent and phosphorescent organic laser systems are appraised, and the chemistry and spectroscopic properties of rare-earth chelates are analyzed. B.B.

#### A66-36971

##### Q MODULATION OF LASERS.

R. W. Hellwarth (Hughes Aircraft Co., Research Laboratories, Malibu, Calif.).

IN: LASERS. VOLUME 1.

Edited by A. K. Levine.

New York, Marcel Dekker, Inc., 1966, p. 253-294. 56 refs.

Discussion of the present state of the theory and applications of Q modulation of lasers. The high-inversion fast-switching case, fast-switching arbitrary-inversion case, slow-switching case, periodic fast switching, and small-amplitude Q modulation are described. Electrooptic, mechanical, and miscellaneous techniques for Q modulation are evaluated. B.B.

#### A66-36972

##### MODES IN OPTICAL RESONATORS.

Herwig Kogelnik (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

IN: LASERS. VOLUME 1.

Edited by A. K. Levine.

New York, Marcel Dekker, Inc., 1966, p. 295-347. 214 refs.

Survey of the mode theory of spherical mirror resonators. Diffraction losses, resonant conditions, and mode patterns are considered, and reference is made to experiments investigating resonator characteristics. Effects of internal-focusing elements such as internal lenses on the optical properties of the resonator are also described. The mode-selective properties of various resonator geometries are discussed. B.B.

#### A66-37141 #

##### SPECTRAL AND ENERGY CHARACTERISTICS OF GIANT PULSES [SPEKTRAL'NYE I ENERGETICHESKIE KHARAKTERISTIKI GIGANTSKIKH IMPUL'SOV].

V. I. Bespalov and G. I. Freidman (Gor'kovskii Gosudarstvennyi Universitet, Nauchno-Issledovatel'skii Radiofizicheskii Institut, Gorki, USSR).

Radiofizika, vol. 9, no. 3, 1966, p. 513-524. 9 refs. In Russian.

The frequency spectrum of the impulse radiated by a laser in the Q-switching regime is shown to be considerably wider than that of a single impulse radiated by a laser in the ordinary (multi-pulsed) regime. This spectrum width has been found to be a function of the laser parameters, and the angular divergence of the light beam has been estimated. The time for stabilization of oscillations in the resonator (impulse delay time) has been determined. The influence has been estimated of the multimode character of radiation upon the impulse form and its energy characteristics. (Author)

#### A66-37142 #

##### LASER WITH Q-SWITCHED RESONATOR [OPTICHESKII KVANTOVYI GENERATOR V REZHIME PEREKLIUCHENIIA DOBROTOSTI REZONATORA].

V. I. Bespalov and Iu. K. Bogatyrev (Gor'kovskii Gosudarstvennyi Universitet, Nauchno-Issledovatel'skii Radiofizicheskii Institut, Gorki, USSR).

Radiofizika, vol. 9, no. 3, 1966, p. 525-537. 10 refs. In Russian.

The results of numerical calculation are given for the problem of solid laser radiation operating in the Q-switched resonator regime. Model of lasers with polarized shutters (of the Pokelsa cell type) and rotating mirror have been considered. Also clarified was the effect of a finite rate of switching, detuning of the laser frequency from the mean frequency of molecular transition, the finiteness of relaxation time, the values of transmission coefficients of laser mirror and some other factors upon the main parameters of the radiation impulse - e.g., the form of the impulse, its duration, power, etc. (Author)

#### A66-37143 #

##### ON RESONANCE FIELD INFLUENCE UPON TWO-PHOTON LASER OPERATION [O VLIANII REZONANSNOGO POLIA NA RABOTU DVOUKH FOTONNOGO LAZERA].

V. S. Butylkin, G. L. Gurevich, M. I. Kheifets, and Iu. G. Khronopulo (Gor'kovskii Gosudarstvennyi Universitet, Nauchno-Issledovatel'skii Radiofizicheskii Institut, Gorki, USSR).

Radiofizika, vol. 9, no. 3, 1966, p. 538-544. 6 refs. In Russian.

It is shown that the presence of a resonator tuned on the frequency of transition between the operating levels of matter considerably deteriorates the conditions of two-photon laser excitation. System parameters have been determined for which operation in the steady-state regime is possible. (Author)

#### A66-37144 #

##### GENERATION OF THE SECOND HARMONIC IN A RESONANCE LASER [O GENERATSII VTOROI GARMONIKI V REZONANSNOM LAZERE].

V. S. Butylkin, G. L. Gurevich, M. I. Kheifets, and Iu. G. Khronopulo (Gor'kovskii Gosudarstvennyi Universitet, Nauchno-Issledovatel'skii Radiofizicheskii Institut, Gorki, USSR).

Radiofizika, vol. 9, no. 3, 1966, p. 545-549. In Russian.

Discussion of the process of frequency doubling in a resonance-laser, induced by an anti-Stokes process in the working volume. Conditions are determined to obtain a substantial second-harmonic field for laser radiation, by applying giant pulses. V. Z.

**A66-37257****DESIGN SYNTHESIS OF LASER COMMUNICATION SYSTEMS.**

Salvador E. Longo (Boeing Co., Aerospace Group, Space Div., Launch Systems Branch, New Orleans, La.) and John H. Williams (NASA, Kennedy Space Center, Fla.).

Institute of Electrical and Electronics Engineers, Summer Power Meeting, New Orleans, La., July 10-15, 1966, Paper. 16 p. 8 refs.

Review of present-day laser communication technology, and description of an approach for designing a laser communication system. A brief explanation is given of the derivation of a laser communication range equation, some modulation and detection techniques, and atmospheric effects. The design of a data transmission link using a laser beam as the carrier is outlined. M.M.

**A66-37285****A HIGH TIME RESOLUTION POLARIMETER FOR LASER ANALYSIS.**

Sun Lu and T. A. Rabson (William Marsh Rice University, Houston, Tex.).

Applied Optics, vol. 5, Aug. 1966, p. 1293-1296. 6 refs. NASA-supported research.

A technique that has a time resolution capability of better than 0.1  $\mu$ sec has been developed for the measurement of the polarization of a light beam. This technique has proven useful in measuring the polarization of pulsed laser beams because changes in polarization from spike to spike also may be measured. In essence, the method of measurement is to split the beam into identical components and to pass these components through various polarization analyzers at different angles. The intensity of the beams after passing through the analyzers is measured by photomultipliers, and the output of the photomultipliers is recorded on oscilloscopes.

(Author)

**A66-37290 #****COMBINATION LASER Q-SWITCH USING A SPINNING MIRROR AND SATURABLE DYE.**

D. Hull (Sandia Corp., Albuquerque, N. Mex.).

Applied Optics, vol. 5, Aug. 1966, p. 1342, 1343. AEC-supported research.

Significant increase in the output peak power of a conventional Q-switched ruby laser, resulting from the use of a saturable dye solution in the laser cavity. Power outputs as high as  $10^9$  W have been obtained by reducing the number of pulses and shortening the pulse duration without decreasing the output energy. R. A. F.

**A66-37343****MASER ACTION IN INTERSTELLAR OH.**

F. Perkins, T. Gold, and E. E. Salpeter (Cornell-Sydney University Astronomy Center, Ithaca, N.Y.).

Astrophysical Journal, vol. 145, July 1966, p. 361-366. 12 refs. Contracts No. AF 49(638)-1156; No. AF 49(638)-1527

Description of one possible set of stimulated emission processes which may be required to interpret the complex observational results of OH microwave emission from certain points in the sky. The scheme discussed utilizes anisotropic UV radiation in the neighborhood of 3080 Å from the H II region, incident on a nearby H I region that contains OH. The manner in which this radiation leads to alignment of the molecule and to population inversions is considered, and the theoretical results are compared with observations. Some difficulties regarding brightness temperatures and type of polarization remain. D.H.

**A66-37353 #****ON THE THEORY OF A GAS LASER IN A MAGNETIC FIELD.**

M. I. D'iaconov and V. I. Perei'.

(Optika i Spektroskopiia), vol. 20, Mar. 1966, p. 472-480.)

Optics and Spectroscopy, vol. 20, Mar. 1966, p. 257-261. 17 refs. Translation.

[For abstract see issue 15, page 2516, Accession no. A66-29348]

**A66-37355 #****ON NONLINEAR LOSSES IN POWERFUL LASERS.**

B. P. Kirsanov and A. S. Selivanenko.

(Optika i Spektroskopiia), vol. 20, Mar. 1966, p. 490, 491.)

Optics and Spectroscopy, vol. 20, Mar. 1966, p. 268, 269. 7 refs. Translation.

[For abstract see issue 15, page 2516, Accession no. A66-29350]

**A66-37357 #****REGENERATIVE OPTICAL HELIUM-NEON AMPLIFIER.**

V. V. Lebedeva, A. I. Odintsov, I. V. Lebedev, V. M. Andriakhin, E. S. Gudovich, and I. P. Ponomareva.

(Optika i Spektroskopiia), vol. 20, Mar. 1966, p. 501-503.)

Optics and Spectroscopy, vol. 20, Mar. 1966, p. 277, 278. 7 refs. Translation.

[For abstract see issue 15, page 2516, Accession no. A66-29352]

**A66-37358 #****Q SWITCHING OF A RUBY-LASER RESONATOR WITH THE AID OF CLEARING SUBSTANCES OF THE PHTHALOCYANINE SERIES.**

Iu. M. Griaznov, O. L. Lebedev, and A. A. Chastov.

(Optika i Spektroskopiia), vol. 20, Mar. 1966, p. 503-505.)

Optics and Spectroscopy, vol. 20, Mar. 1966, p. 278, 279. 5 refs. Translation.

[For abstract see issue 15, page 2516, Accession no. A66-29353]

**A66-37360 #****ON THE SPECTRAL COMPOSITION OF GENERATED RADIATION IN THE CASE OF NONLINEAR OPTICAL PHENOMENA.**

V. L. Strizhevskii.

(Optika i Spektroskopiia), vol. 20, Mar. 1966, p. 516-519.)

Optics and Spectroscopy, vol. 20, Mar. 1966, p. 287, 288. 12 refs. Translation.

[For abstract see issue 15, page 2542, Accession no. A66-29356]

**A66-37361 #****INVESTIGATIONS OF THE DEPENDENCE OF THE DISCHARGE PARAMETERS AND GENERATING POWER OF THE He-Ne LASER ON THE HOLLOW CATHODE DIAMETER.**

V. B. Znamenskii, G. N. Buinov, and E. S. Bursakov.

(Optika i Spektroskopiia), vol. 20, Mar. 1966, p. 522-524.)

Optics and Spectroscopy, vol. 20, Mar. 1966, p. 292, 293. Translation.

[For abstract see issue 15, page 2516, Accession no. A66-29357]

**A66-37362 #****CaF<sub>2</sub>-Sm<sup>2+</sup> CRYSTAL LASER EXCITED BY A RUBY LASER.**

V. K. Koniukhov, V. M. Marchenko, and A. M. Prokhorov.

(Optika i Spektroskopiia), vol. 20, Mar. 1966, p. 531, 532.)

Optics and Spectroscopy, vol. 20, Mar. 1966, p. 299, 300. 10 refs. Translation.

[For abstract see issue 15, page 2516, Accession no. A66-29358]

**A66-37367 #****INVESTIGATION OF THE DEPENDENCE OF THE DURATION AND SHAPE OF "GIANT" PULSES ON THE INVERSE POPULATION COEFFICIENT [ISSLEDOVANIIE ZAVISIMOSTI DLITEL'NOSTI I FORMY "GIGANTSKOGO" IMPUL'SA OT KOEFFITSIENTA INVERS-NOI ZASELENNOSTI].**

V. I. Malyshev and A. S. Markin (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 50, June 1966, p. 1458-1463. 8 refs. In Russian.

The possibility of performing an experiment for quantitative verification of the conclusions of the theory of giant pulse formation is considered. It is shown that such a comparison is possible for a Q-switched laser with a passive shutter. The duration and shape of

giant pulses in neodymium glass laser are measured for various values of the inverse population, and the results are compared with the theoretical predictions. It is shown that at sufficiently large values of the inverse population coefficient the experimental results are in good agreement with the theory. (Author)

**A66-37401****GALLIUM ARSENIDE-PHOSPHIDE - CRYSTAL, DIFFUSION AND LASER PROPERTIES.**

C. J. Nuese, G. E. Stillman, and N. Holonyak, Jr. (Illinois, University, Dept. of Electrical Engineering and Materials Research Laboratory, Urbana, Ill.).

*Solid-State Electronics*, vol. 9, Aug. 1966, p. 735-749. 51 refs.

Contract No. AF 19(628)-4337; Grant No. AF AFOSR 714-65; ARPA Contract No. SD-131.

Description of crystal growth, diffusion, and fabrication conditions which yield Ga(AsP) junction lasers with threshold current densities as low as 3000 A/cm<sup>2</sup>. A slow vapor transport method of crystal growth is found to result in uniform quality material, while deep junctions diffused under excess As vapor pressure are adequately planar. A study of Zn diffusion into n-type Ga(As<sub>1-x</sub>P<sub>x</sub>) shows that p-n junction depths depend on the usual diffusion parameters and significantly on the crystal composition of Ga(As<sub>1-x</sub>P<sub>x</sub>) and the surface preparation of the wafers prior to diffusion. B. B.

**A66-37408****NONRECIPROCAL EFFECTS AND COUPLINGS IN A RING LASER [EFFETS NON RECIPROQUES ET COUPLAGES DANS UN LASER EN ANNEAU].**

Benjamin Dessus, Jean-Michel Catherin, and Jacques Migne (Compagnie Générale d'Electricité de Paris, Centre de Recherches, Département Recherches, Marcoussis, Seine-et-Oise, France). *Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques*, vol. 262, no. 26, June 27, 1966, p. 1691-1694. 8 refs. In French.

Experimental investigation of nonreciprocal effects (associated with the excitation current) observed in a dc-excited He-Ne ring laser operating at  $\lambda = 6328 \text{ \AA}$ . It is found that coupling phenomena occur between the right and left waves, which mask this anisotropy in certain regions of the Doppler curve. By precise control of the cavity length it is possible to obtain beats of high stability at certain points of the emission curve. V. P.

**A66-37409****HANLE EFFECT OF NEON ATOMS EMITTED BY A LASER - MULTIPLE COHERENT DIFFUSION AT A METASTABLE LEVEL [EFFET HANLE D'ATOMES DE NEON IRRADIES PAR UN LASER - DIFFUSION MULTIPLE COHERENTE SUR UN NIVEAU METASTABLE].**

Bernard Decomps and Michel Dumont (Paris, Université, Ecole Normale Supérieure, Laboratoire de Spectroscopie Hertzienne, Paris, France).

*Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques*, vol. 262, no. 26, June 27, 1966, p. 1695-1698. 6 refs. In French.

Experimental investigation showing that the magnitude of the Hanle effect of the 2p<sub>4</sub> level of neon depends on the intensity of the excitation discharge. An explanation for this finding is seen in a multiple coherent diffusion effect on the 1s metastable levels. V. P.

**A66-37420****LASER THEORY AND APPLICATION [THEORIE UND ANWENDUNG DES LASERS].**

Herbert Döring. Cologne, Westdeutscher Verlag, 1965, p. 7-32; Discussion, p. 35-40. In German.

Introduction to the principles of laser operation. The principal types of solid-state laser, gas laser, and semiconductor laser are illustrated and discussed. A survey is given of laser applications in

communications systems, navigation, metal working, medicine, chemistry, and physics. Discussion following oral presentation of the paper is included. V. P.

**A66-37439****OPTICS AND RADAR [L'OPTIQUE ET LE RADAR].**

M. H. Carpentier (Ecole Nationale Supérieure de l'Aéronautique; Paris, Institut Supérieur d'Electronique, Paris; Société Française d'Etudes et de Constructions Electroniques, Boulogne-Billancourt; Ecole Supérieure d'Electricité, Malakoff, Seine, France).

*L'Onde Electrique*, vol. 46, June 1966, p. 740-748. In French.

Discussion of optical techniques in detection systems revived by the laser. Apart from obvious such advantages as the practical realization of extremely narrow beams, improved target behavior, etc., using the optical spectrum permits achieving greater accuracy in certain calculations than would be the case at the lower frequencies used in conventional electronic applications. This last advantage is given particular consideration. M. M.

**A66-37443****SOME TECHNIQUES FOR EMPLOYING A CONTINUOUS-WAVE GAS LASER AS A LIGHT SOURCE IN SCATTERED-LIGHT STATIC PHOTOELASTICITY.**

Y. F. Cheng (Boeing Co., Scientific Research Laboratories, Seattle, Wash.).

*Experimental Mechanics*, vol. 6, Aug. 1966, p. 431, 432.

Outline of some techniques for using a CW gas laser as a light source in scattered-light static photoelasticity studies. It is shown that when using the scattered-light method without employing a Babinet-Soleil compensator, it is necessary to rotate the plane of polarization of the incident beam to determine the directions of and the differences between the secondary principal stresses. A live-loaded stress pattern taken with a 1-mm linearly polarized beam traveling at 1-in./min is illustrated. B. B.

**A66-37453****AVALANCHE TRANSISTORS TO GENERATE JITTER-FREE NANOSECOND CURRENT PULSES FOR DRIVING GaAs LASER DIODES AT LOW TEMPERATURES.**

Y. U. Hussain (London, City University, Dept. of Electrical and Electronic Engineering, London, England).

*Electronics Letters*, vol. 2, July 1966, p. 268, 269.

GaAs laser diodes can be modulated at very high frequencies. Transistors operating in the avalanche mode are capable of producing very fast jitter-free pulses. The current output is comparable to that required by GaAs laser diodes at low temperatures. It is observed that avalanche-transistor performance is not significantly affected by cooling to low temperatures. It can therefore be used to directly drive a laser diode at low temperatures. This overcomes the problems associated with transmission of very fast current pulses at low impedance levels. (Author)

**A66-37523 #****CIRCULAR JOINT FOR THE ADJUSTMENT AND FASTENING OF THE MIRRORS AND PORTS OF A GAS LASER [SHAROVNI SHARNIR DLI IUSTIROVKI I KREPLENIIA ZERKAL I OKON GAZOVOGO LAZERA].**

V. P. Zaitsev (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*Priboiy i Tekhnika Eksperimenta*, vol. 11, May-June 1966, p. 214, 215. In Russian.

Description of a spherical coupler for fastening the mirrors and the plane-parallel plates at the Brewster angle in a gas laser. The device makes it possible to quickly and precisely adjust the laser and to orient in any way the electrical field vector of the emitted light waves. R. A. F.

**A66-37546**

INVESTIGATION OF STIMULATED EMISSIONS IN THE SUB-MILLIMETER WAVELENGTH RANGE WITH A FABRY-PEROT CROSS-GRATING INTERFEROMETER [UNTERSUCHUNG STIMULIERTER EMISSIONEN IM SUBMILLIMETERWELLENBEREICH MIT EINEM KREUZGITTER FABRY-PEROT INTERFEROMETER].  
J. Steffen, H. Steffen, J.-F. Moser, and F. K. Kneubühl (Eidgenössische Technische Hochschule, Laboratorium für Festkörperphysik, Zurich, Switzerland).  
*Zeitschrift für angewandte Mathematik und Physik*, vol. 17, May 25, 1966, p. 470-472. In German.

Discussion of laser emission interferograms obtained with a Fabry-Pérot cross-grating interferometer in the submillimeter wavelength range. The experimental technique is briefly described.  
V. Z.

**A66-37547**

STIMULATED EMISSION FROM ICN AT WAVELENGTHS UP TO 0.774 mm [STIMULIERTE EMISSION VON ICN BIS ZU 0.774 mm WELLENLÄNGE].  
H. Steffen, J. Steffen, J.-F. Moser, and F. K. Kneubühl (Eidgenössische Technische Hochschule, Laboratorium für Festkörperphysik, Zurich, Switzerland).  
*Zeitschrift für angewandte Mathematik und Physik*, vol. 17, May 25, 1966, p. 472-474. 7 refs. In German.

Observation of submillimeter laser emission from ICN. Interferograms obtained using the submillimeter laser described by Camani, Kneubühl, Moser, and H. Steffen (1965) show emissions at 0.3109, 0.3365, 0.3366, 0.5375, 0.5385, and 0.7735 mm. R. A. F.

**A66-37548**

THRESHOLD DETERMINATION OF A RUBY LASER BY SINGLE PULSE TECHNIQUE.

A. Roulier, R. Dändliker, and H. P. Brändli (Bern, Universität, Institut für angewandte Physik, Berne, Switzerland).  
*Zeitschrift für angewandte Mathematik und Physik*, vol. 17, May 25, 1966, p. 474-476.

Derivation of a relation to calculate the threshold energy of a ruby laser from the time delay between the onset of the pump pulse and the beginning of the laser emission at a pump energy above threshold in terms of the flashlamp input energy. Using this method the threshold of a pulsed ruby laser can be determined by one single pulse.  
M. M.

**A66-37549**

POLARIZATION OF RADIATION FROM GaAs LASER DIODES [DIE POLARISATION DER STRAHLUNG VON GaAs-LASERDIODEN].  
E. Mohn, J. Hatz, and Ch. Deutsch (Bern, Universität, Institut für angewandte Physik, Berne, Switzerland).  
*Zeitschrift für angewandte Mathematik und Physik*, vol. 17, May 25, 1966, p. 476, 477. In German.

Investigation of polarization of pulsed radiation in 16 individual units of a single GaAs laser diode type in an attempt to determine the origin of natural oscillations of the laser resonator. The modes of the arising polarization spectra are discussed.  
V. Z.

**A66-37550**

SECOND-HARMONIC FREQUENCY GENERATION OF AN Nd LASER IN KDP [ÜBER DIE ERZEUGUNG DER 2. HARMONISCHEN FREQUENZ DER STRAHLUNG EINES Nd-LASERS IN KDP].  
H. P. Weber and E. Mathieu (Bern, Universität, Institut für angewandte Physik, Berne, Switzerland).  
*Zeitschrift für angewandte Mathematik und Physik*, vol. 17, May 25, 1966, p. 477, 478. In German.

Preliminary report on observations of second-harmonic frequency generation obtained in the process of optical mixing of collinear Nd laser beams. The conditions for the required phase matching are discussed.  
V. Z.

**A66-37565 #**

CdSe-BASED SEMICONDUCTOR LASER WITH TWO-PHOTON OPTICAL EXCITATION [POLUPROVODNIKOVYI KVANTOVYI GENERATOR NA CdSe S DVOUKHFOTONNYM OPTICHESKIM VOZBUZHDENIEM].

A. Z. Grasiuk, V. F. Efimkov, I. G. Zubarev, V. A. Katulin, and A. N. Mentser (Akademiia Nauk SSSR, Fizicheskii Institut, Institut Stali i Splavov, Moscow, USSR).

*Fizika Tverdogo Tela*, vol. 8, June 1966, p. 1953, 1954. In Russian.

Brief note on the light emission obtained from a CdSe semiconductor stimulated by the radiation of an Nd laser with a modulated Q-factor. The experimental technique is briefly described and the spectral characteristics of the CdSe emission are given.  
V. Z.

**A66-37583 #**

ANALYSIS AND OPTIMIZATION OF THE PARAMETERS OF SINGLE-CAVITY MICROWAVE LASER AMPLIFIERS [ANALIZA I OPTYMALIZACJA PARAMETRÓW JEDNOREZONATOROWEGO MIKROFALOWEGO WZMACNIACZA KWANTOWEGO].

A. Jeleński (Polska Akademia Nauk, Instytut Podstawowych Problemów Techniki, Zakład Magnetyków, Warsaw, Poland).  
*Archiwum Elektrotechniki*, vol. 15, no. 2, 1966, p. 421-444. 10 refs. In Polish.

Analysis of a resonant circuit containing a paramagnetic substance. Formulas are derived for the gain, bandwidth, and noise measure of a laser amplifier; the effect of the Q factor of the cavity, the quality of the crystal, and the width of the magnetic resonance line are discussed.  
R. A. F.

**A66-37584 #**

ENERGY LEVELS AND MATRIX ELEMENTS OF RUBY [POZIOMY ENERGETYCZNE I ELEMENTY MACIERZOWE RUBINU].

H. Szymczak (Polska Akademia Nauk, Instytut Podstawowych Problemów Techniki, Zakład Magnetyków, Warsaw, Poland).  
*Archiwum Elektrotechniki*, vol. 15, no. 2, 1966, p. 445-458. 5 refs. In Polish.

Calculation of eigenvalues and eigenfunctions of the spin Hamiltonian and the matrix elements of the spin operator of ruby. The calculations were carried out for 54.7 and 90° angles between the trigonal axis of the ruby and the direction of the magnetic field, with the anisotropy of the ruby crystal being taken into account.  
R. A. F.

**A66-37588 #**

PULSE GENERATOR FOR DRIVING A LASER DIODE [GENERATOR IMPULSOWY DO ZASILANIA DIODY LASEROWEJ].

J. Szerszeń (Polska Akademia Nauk, Instytut Podstawowych Problemów Techniki, Zakład Elektroniki, Warsaw, Poland).  
*Archiwum Elektrotechniki*, vol. 15, no. 2, 1966, p. 546, 547. In Polish.

Description of a pulse-generating device for driving a semiconductor laser diode. A circuit diagram and the measured operating characteristics are given.  
R. A. F.

**A66-37629 #**

LASER LINES FROM CO<sub>2</sub> IN THE 11-18 MICRON REGION.

B. Hartmann and B. Kleman (Research Institute of National Defence, Stockholm, Sweden).  
*Canadian Journal of Physics*, vol. 44, July 1966, p. 1609-1612. 14 refs.

Identification of a number of lines at 11 μ emitted from a pulsed CO<sub>2</sub> laser as the P branch of the CO<sub>2</sub> vibrational transition (01<sup>1</sup>1) - (11<sup>1</sup>0). Five other transitions between 13 and 18 μ have been observed. The possibilities that these are perpendicular transitions with Δv<sub>2</sub> = 1 are discussed.  
W. M. R.

**A66-37638**

THE USE OF THE FIRST AND SECOND HARMONIC OF RUBY LASER LIGHT IN THE STUDY OF A FAST THETA-PINCH.  
S. Martellucci and E. Mazzucato (EURATOM and Comitato Nazionale per l'Energia Nucleare, Laboratorio Gas Ionizzati, Frascati, Italy).  
Nuovo Cimento, vol. 44B, July 11, 1966, p. 107-118. 10 refs.

By using as light source the first and second harmonic of a 20-Mw ruby laser the schlieren technique has been applied to the study of the implosion of a fast not preionized theta pinch. It has been found that the gradients of neutral atoms have a refractive effect much lower than that of electrons and, at any rate, below the sensitivity limit of the schlieren mounting used. (Author)

**A66-37656**

LUMINESCENCE AND GENERATION IN  $\text{CaF}_2:\text{Dy}^{2+}$  CRYSTALS EXCITED WITH A RUBY LASER.

E. M. Zolotov, A. M. Prokhorov, and G. P. Shipulo (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).  
(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 49, Sept. 1965, p. 720-723.)

Soviet Physics - JETP, vol. 22, Mar. 1966, p. 498-500. 7 refs. Translation.

[For abstract see issue 01, page 82, Accession no. A66-10718]

**A66-37661**

NONLINEAR MODE INTERACTION IN LASERS.

N. G. Basov, V. N. Morozov, and A. N. Oraevskii (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).  
(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 49, Sept. 1965, p. 895-904.)

Soviet Physics - JETP, vol. 22, Mar. 1966, p. 622-628. 22 refs. Translation.

[For abstract see issue 01, page 82, Accession no. A66-10724]

**A66-37663**

OPERATING FEATURES OF THE RING LASER.

I. L. Bershtein and Iu. I. Zaitsev (Gor'kovskii Gosudarstvennyi Universitet, Radiofizicheskii Institut, Gorki, USSR).  
(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 49, Sept. 1965, p. 953-959.)

Soviet Physics - JETP, vol. 22, Mar. 1966, p. 663-667. 6 refs. Translation.

[For abstract see issue 01, page 82, Accession no. A66-10726]

**A66-37687**

ASYMMETRY OF EXCITATION OF VARIOUS MODES OF OSCILLATION IN SEMICONDUCTOR LASERS.

O. N. Krokhin and A. V. Uspenskii (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).  
(Fizika Tverdogo Tela, vol. 8, Feb. 1966, p. 511-514.)  
Soviet Physics - Solid State, vol. 8, Aug. 1966, p. 405-408. Translation.

[For abstract see issue 12, page 1890, Accession no. A66-24455]

**A66-37743**

LASER TELEVISION SYSTEM.

Robert S. Rowley (Perkin-Elmer Corp., Electro-Optical Div., Norwalk, Conn.).

Society of Motion Picture and Television Engineers, Semiannual Technical Conference, 99th, Washington, D.C., May 1-6, 1966, Paper. 6 p.

Description of a television system which requires no studio lights or other external sources of illumination and which was developed by the Perkin-Elmer Corp. Scanned by rapidly moving narrow lines of red laser light, objects in total darkness appear sharply and clearly on the TV screen, as if in daylight illumination. The properties of this laser TV system are reviewed. First, the system has an essentially infinite depth of focus. A second effect of the nonimaging characteristic is that light sources in the field of view are not imaged. A third property of the system is that various

"lighting" effects may be achieved by varying the position of the photodetector. The applications of the system are discussed.

M. F.

**A66-37768**

ULTRAVIOLET  $\text{ZnO}$  LASER PUMPED BY AN ELECTRON BEAM.

F. H. Nicoll (Radio Corporation of America, RCA Laboratories, Princeton, N.J.).

Applied Physics Letters, vol. 9, July 1, 1966, p. 13-15. 5 refs.

Pulsed operation of an electron-beam-pumped  $\text{ZnO}$  laser emitting radiation in the ultraviolet at temperatures near that of liquid nitrogen. Laser threshold is reached at 15 kv and about 3 amp/cm<sup>2</sup>. The measured efficiency is about 0.1% at 24 kv and 5 amp/cm<sup>2</sup>. The use of a cavity with grown faces and cleaved sides is considered to be crucial to the emission.

R. A. F.

**A66-37771**

CONTINUOUSLY-OPERATED ULTRAVIOLET LASERS.

Roy Paananen (Raytheon Co., Research Div., Waltham, Mass.).

Applied Physics Letters, vol. 9, July 1, 1966, p. 34, 35.

Observation of CW UV ionized-gas laser emission over four transitions in three of the noble gases. The two lines in single ionized Ne occur at 3324 and 3378 Å, while Kr and Ar exhibit doubly ionized lasing at 3507 and 3511 Å, respectively. These four are all strong or characteristic lines of their particular gases, and the wavelength identification is carried out only far enough to separate each from its nearest neighbor without ambiguity.

R. A. F.

**A66-37774**

EFFECTS OF CASCADE IN THE EXCITATION OF THE  $\text{Ar II}$  LASER.

R. I. Rudko and C. L. Tang (Cornell University, School of Electrical Engineering, Ithaca, N.Y.).

Applied Physics Letters, vol. 9, July 1, 1966, p. 41-44. 6 refs. USAF-supported research.

Experimental evidence for the theory that the upper laser states (the 4p levels of  $\text{Ar}^+$ ) on the discharge current in a CW argon ion laser derive a large part of their population through cascade transitions from the higher-lying states of  $\text{Ar}^+$  (predominantly the 4d states). The results also indicate that the current-dependence of the laser output is consistent with the measured current-dependence of the cascade transition rate.

R. A. F.

**A66-37777**

RAMAN LASERS USING SECONDARY RAMAN LINES.

S. E. Schwarz (California, University, Dept. of Electrical Engineering, Berkeley, Calif.) and A. Pine (Harvard University, Div. of Engineering and Applied Physics, Gordon McKay Laboratory, Cambridge, Mass.).

Applied Physics Letters, vol. 9, July 1, 1966, p. 49-51. 5 refs.

Research supported by the Joint Services Electronics Program and the Navy.

Investigation of the ways in which significant quantities of coherent radiation can be produced at frequencies associated with the weaker secondary Raman lines of an organic material. Two approaches have been tried: the first involves straightforward application of selective feedback; a second, less apparent method has been found, which is explained in terms of Raman laser saturation mechanisms. Particular attention has been given to cyclohexane as the Raman material; it gives narrow Raman laser lines and has very little tendency to self-focus, presumably because the molecule is highly symmetric.

W. M. R.

**A66-37778**

MODE COUPLING DUE TO BACKSCATTERING IN A He-Ne TRAVELING-WAVE RING LASER.

Frederick Aronowitz (Honeywell, Inc., Systems and Research Center, Minneapolis, Minn.) and R. J. Collins (Minnesota, University, Dept. of Electrical Engineering, Minneapolis, Minn.).

Applied Physics Letters, vol. 9, July 1, 1966, p. 55-58. 5 refs. NASA-supported research.

Discussion of a modification of an He-Ne traveling-wave ring laser that includes a coupling between the oppositely directed traveling waves (ODTWs) in the form of a mutual backscattering of energy from each beam into the direction of the other. This backscattering provides a mechanism for strong mode competition between the OTDWs and also predicts frequency lock-in. V. Z.

**A66-37779****HIGH PRESSURE, HIGH MAGNETIC FIELD EFFECTS IN CONTINUOUS ARGON LASERS.**

I. Gorog and F. W. Spong (Radio Corporation of America, RCA Laboratories, David Sarnoff Research Center, Princeton, N. J.), *Applied Physics Letters*, vol. 9, July 1, 1966, p. 61-63. 8 refs.

Investigation of the nature of a degradation in the performance of a continuous argon laser positioned in an axial magnetic field. The degradation sets in when the magnetic field is further increased after producing at a certain point an optimum laser field value. It is believed that a physical explanation of the phenomenon should be sought in terms of radiation trapping and the excitation mechanisms rather than in terms of losses sustained by the radiation field in the cavity or in terms of magnetic field-induced splitting of the atomic levels involved in the laser transitions. V. Z.

**A66-37781****HIGH-ENERGY ATOMIC IODINE PHOTODISSOCIATION LASER.**

A. J. DeMaria and C. J. Ultee (United Aircraft Corp., Research Laboratories, East Hartford, Conn.), *Applied Physics Letters*, vol. 9, July 1, 1966, p. 67-69.

Note on successful generation of energy outputs up to 65 joules and peak power outputs up to  $10^5$  watts for 1.5  $\mu$ sec from a  $\text{CF}_3\text{I}$  photodissociation laser system. The dependence of output energy on pressure, temperature, and number of successive optical pumping flashes is given for the system, with mirror reflectivities of 94 and 4% and a pumping flash of 1.5  $\mu$ sec. Typical oscillograms of the process are included. V. Z.

**A66-37782****THE EFFECT OF IMPURITY CONCENTRATION ON THE MAXIMUM CW POWER FROM GALLIUM ARSENIDE LASERS AT 77°K.**

K. M. Hergenrother and J. M. Feldman (Northeastern University, Boston, Mass.), *Applied Physics Letters*, vol. 9, July 1, 1966, p. 70, 71. USAF-supported research.

Consideration of the self-absorption, in the bulk material of a GaAs laser, of photons generated in the inversion region during sustained oscillations. It is shown that the dependence of this self-absorption on the doping level suggests the existence of an optimum doping for a given heat sink temperature. V. Z.

**A66-38004 \*****ADVENT OF LASERS AND REFLECTED WAVE TUBES WITH AN OVERLAPPING EFFECTIVE WAVE RANGE [NACHALO VZAIMNOGO PEREKRYTIIA DIAPAZONOV, OSVAIVAE MYKH LAZERAMI I LAMPAMI OBRATNOI VOLNY].**

M. B. Golant, V. S. Savel'ev, Z. S. Korotkova, Z. T. Alekseenko, and M. I. Ermakova. *Radiotekhnika i Elektronika*, vol. 11, July 1966, p. 1321, 1322. In Russian.

Brief note on recent advances in the field of electron devices and quantum devices effective in the submillimeter wavelength range. A reflected wave tube, developed by the authors in 1965, is mentioned as a development producing a substantial overlapping of wavelengths covered both by lasers and by reflected wave tubes. The tube is effective at wavelengths as low as 0.296 mm. V. Z.

**A66-38127****SPECTRAL PROPERTIES OF STIMULATED EMISSION IN A BROAD PUMPING RANGE.**

B. L. Livshitz and V. N. Tsikunov (Akademii Nauk SSSR, Institut Obshchei i Neorganicheskoi Khimii, Moscow, USSR). (*Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, vol. 49, Dec. 1965, p. 1843-1849.)

*Soviet Physics - JETP*, vol. 22, June 1966, p. 1260-1263. 10 refs. Translation.

Discussion of the stimulated emission spectrum obtained in an axial-mode model of a plane resonator in the stationary generation regime. The shape of the emission lines is determined as a function of the pumping intensity. The existence of a limiting spectral width is established. The process of narrowing of this stimulated emission spectrum during the motion of the active centers along the resonator axis is analyzed. V. Z.

**A66-38238****INTERNAL LASER MODULATION BY ACOUSTIC LENS-LIKE EFFECTS.**

A. J. DeMaria and G. E. Danielson (United Aircraft Corp., Research Laboratories, East Hartford, Conn.), *IEEE Journal of Quantum Electronics*, vol. QE-2, July 1966, p. 157-164. 16 refs.

Contract No. DA-28-043-AMC-00259(E).

A cylindrical acoustic wave in a laser medium will function as a time-varying, converging-diverging optical waveguide. An analytical examination of the trajectories of light rays propagating through a medium subjected to acoustic waves is presented. The use of acoustically generated, periodic refraction index perturbations for modulating the output of a  $\text{Nd}^{3+}$ -doped glass laser without having to insert lossy optical elements into the Fabry-Pérot feedback interferometer is reported. The properties of this type of laser control are (1) increased output laser energy, (2) periodic time variation of the resonance mode structure, (3) uniform pulse heights, and (4) repetitive pulse train at a controlled frequency. (Author)

**A66-38239****Cr-TiO<sub>2</sub> AS AN L-BAND MASER MATERIAL.**

K. S. Yngvesson.

*IEEE Journal of Quantum Electronics*, vol. QE-2, July 1966, p. 165-172. 23 refs.

Research supported by the Swedish Technical Research Council and the Magnus Bergvalls Stiftelse.

The inverted susceptibility is used as a figure of merit to discuss the maser properties of Cr-TiO<sub>2</sub> at L-band frequencies. This material has the advantage of a high inversion ratio and narrow linewidth resulting in a gain per unit length 10 to 25 times larger than for ruby in the liquid helium temperature range. The optimum concentration of  $\text{Cr}^{3+}$  is found to be around 0.016% from measured data at 1.4 Gc. The gain calculated from the figure of merit agrees with measurements on an actual 1.4 Gc traveling-wave maser. The decrease in inversion ratio with increasing  $\text{Cr}^{3+}$  concentration is an important factor which determines the behavior of the figure of merit. This variation is shown to be consistent with calculations based on a simplified spin-lattice relaxation model. (Author)

**A66-38240****GAS DISCHARGE MODULATION NOISE IN He-Ne LASERS.**

L. J. Prescott (International Business Machines Corp., Components Div., East Fishkill, N. Y.) and A. Van Der Ziel (Minnesota, University, Dept. of Electrical Engineering, Minneapolis, Minn.), *IEEE Journal of Quantum Electronics*, vol. QE-2, July 1966, p. 173-177. 7 refs.

Research supported by the U.S. Signal Corps, the University of Minnesota, and NSF.

The paper reports measurements on laser light noise and discharge current noise in a 6328-Å He-Ne laser. A cross-correlation experiment shows a strong correlation between the two noise phenomena, indicating that the laser light noise is caused by the modulation of the light beam by the discharge current noise. The discharge current noise has a spectrum with a sharp resonance at 40 kc that does not show up in the laser light noise. The noise is represented by an equivalent circuit. By measuring the two noise spectra and the absolute value and the phase of the cross-correlation coefficient as functions of frequency, it is possible to evaluate some of the components of the equivalent circuit. The values thus obtained turn out to be quite reasonable, which supports the assumptions on which the equivalent circuit is based. (Author)

**A66-38241****FREQUENCY STABILIZATION OF A GAS LASER.**

T. G. Polanyi, M. L. Skolnick (Laser, Inc., Briarcliff Manor, N. Y.), and I. Tobias (Rutgers University, School of Chemistry, New Brunswick, N. J.).

IEEE Journal of Quantum Electronics, vol. QE-2, July 1966, p. 178, 179. 5 refs.

Initial stabilization results obtained with a method recently described (Tobias, Skolnick, Wallace, and Polanyi, 1965) in which a laser with internal mirrors is placed in an axial magnetic field to lock the output frequency to the center of an atomic resonance. The circular dichroism and birefringence induced in the active medium by the field produce in the laser output right and left circularly polarized components which generally differ in intensity and frequency. The intensity difference between the components is a function of their average frequency. The proposed method of generating a frequency-sensitive error signal may offer certain advantages in that it does not involve modulation of any of the characteristics of the laser, nor is there need for a second laser or an external cell.

W. M. R.

**A66-38242****HIGH POWER NON-SPIKING OPERATION OF RUBY LASER.**

D. V. Keller (Defense Research Corp., Santa Barbara, Calif.) and B. I. Davis (Northrop Corp., Northrop Nortronics, Applied Research Dept., Newbury Park, Calif.).

IEEE Journal of Quantum Electronics, vol. QE-2, July 1966, p. 179-181. 7 refs.

Operation of a regular spiking ruby laser completely immersed in a liquid of sufficiently high index ( $n > 1.47$ ) in order to make the output continuous on a microscopic as well as macroscopic scale. The immersed laser was operated in the feedback mode. At high power levels such that sufficient voltage for feedback to the Kerr cell was obtained, the output was continuous (spikeless) and virtually ripple-free. An average continuous output of 10 kw was easily produced for the duration of the pumping cycle (1/2 msec), representing an average power conversion efficiency of about 0.02%. The beam divergence remained the same as for a dry or immersed ruby without feedback.

W. M. R.

**A66-38243****90° ROTATION BETWEEN NEAR FIELD AND FAR FIELD OF RUBY LASERS.**

Dieter Roess (Siemens und Halske AG, Central Laboratories, Munich, West Germany).

IEEE Journal of Quantum Electronics, vol. QE-2, July 1966, p. 181, 182. 8 refs.

Attempt to explain the 90° rotation of the elongation axis of ruby laser beams with roughly elliptical beam cross sections when the near field is compared with the far-field distribution. The effect, very pronounced in cylindrical pumping systems, is usually explained as a consequence of diffraction. As an alternative, the confocal resonator theory developed by Boyd and Gordon and by Boyd and Kogelnik is extended to include the thermal curvature induced in the laser material by relaxation transitions.

W. M. R.

**A66-38244****ELECTRON BEAM SCANLASER.**

R. V. Pole and R. A. Myers (International Business Machines Corp., Thomas J. Watson Research Center, Yorktown Heights, N. Y.).

IEEE Journal of Quantum Electronics, vol. QE-2, July 1966, p. 182-184. 8 refs.

Preliminary results of the successful operation of the electron beam scanlaser, a laser-scanning device in which the transverse position of focused light is controlled by means of an electron beam. In the scanlaser (unlike other methods of scanning laser light) the method of scanning is based on a laser cavity which is directly and/or transversely degenerate and in which the Q is spoiled for all modes but one. Scanning in this manner offers two key advantages:

every single mode uses the entire, or nearly the entire, active volume, and the nonlinearity of Q spoiling provides for minimal deflection energy. The resonator used is the flat-field conjugate (FFC) resonator or a variant of it called the folded FFC resonator, either one of which is capable of supporting as many as  $10^7$  nearly degenerate transverse modes. Mode selection is accomplished by means of a modified electrooptic display tube, in which an electron beam induces a localized birefringence in an electrooptic crystal.

W. M. R.

**A66-38245****GIANT PULSE LASER OPERATION WITH SEMICONDUCTOR MIRRORS.**

M. Birnbaum and T. L. Stocker (Aerospace Corp., El Segundo, Calif.).

IEEE Journal of Quantum Electronics, vol. QE-2, July 1966, p. 184, 185. 6 refs.

Contract No. AF 04(695)-669.

Test of three methods intended to alleviate the problem posed by mirror damage in giant pulse operation. They include (1) use of a high-melting-point semiconductor, boron (2100°C); (2) operation with the semiconductor mirrors cooled to approximately 100°K; and (3) operation at oblique incidence. Operation at oblique incidence provided limited repetitive operation with InSb and InAs. No substantial reduction in damage was observed with the other methods.

W. M. R.

**A66-38266****HIGH POWER FROM PULSED GAS LASER.**

E. T. Gerry and D. A. Leonard (Avco Corp., Avco-Everett Research Laboratory, Everett, Mass.).

Space/Aeronautics, vol. 46, July 1966, p. 92, 94, 96, 98, 99.

Description of a pulsed nitrogen laser emitting at 3371 Å in the ultraviolet. The laser has a gain of more than 60 db/m and a self-terminating 20-nsec pulse which can be synchronized without the complications of conventional Q-switching. The theoretical basis of the laser is developed along with its experimental realization.

V. Z.

**A66-38386****LIQUID-NITROGEN COOLING OF A RUBY ROD.**

D. L. Mickey (Princeton University, Plasma Physics Laboratory, Princeton, N. J.).

Journal of Applied Physics, vol. 37, July 1966, p. 2963, 2964.

AEC Contract No. AT(30-1)-1238; NSF Grant No. GP-579.

Numerical solutions of the one-dimensional heat-flow equation have been obtained for a liquid-nitrogen end-cooled ruby laser rod. Temperature distributions, cooling times, and heat fluxes have been obtained for four initial rod temperatures from 150 to 350°K.

(Author)

**A66-38387****LASER AMPLIFIER NOISE AT 3.5 MICRONS IN HELIUM-XENON.**

J. W. Klüver (Bell Telephone Laboratories, Inc., Murray Hill, N. J.).

Journal of Applied Physics, vol. 37, July 1966, p. 2987-2999. 15 refs.

The noise added to the amplified signal in laser amplifiers results from spontaneous emission in the laser medium. A measurement of the intensity of the spontaneous emission noise has been performed at the high-gain 3.508-μ line in a dc-excited He-Xe discharge. Measurements were made with the laser amplifier operating under normal low-level signal conditions as well as under high-level, saturated conditions. It is found that the measured values of the noise power agree closely with the expressions derived for a four-level excitation system using a plane wave propagation model. The low-level measurement yields a population inversion of  $2.6 \pm 0.3$ . For an amplifier with an unsaturated gain of 17 db and a saturated gain of 1 db, the increase in the noise output power is only 7 db over that of an equivalent unsaturated 1-db amplifier. The measurement of the noise power under saturation gave a ratio of the saturated to the unsaturated upper level population of 0.4. The measurements indicate that the 3.508-μ line has good noise properties. The experiments and the theoretical analysis apply to a one-dimensional geometry in which variations in the transverse direction are negligible.

(Author)



**A66-38388**

VARIATION OF THE GAIN FACTOR OF GaAs LASERS WITH PHOTON AND CURRENT DENSITIES.  
Yasuo Nannichi (Nippon Electric Co., Ltd., Central Research Laboratories, Kawasaki, Japan).

*Journal of Applied Physics*, vol. 37, July 1966, p. 3009-3012.  
7 refs.

The variation of the gain factor with the threshold current was studied in two cases, viz., (1) a reflective film was applied on one end of a GaAs laser, and (2) antireflective films were applied on both ends of the laser. In (1) the threshold current is reduced to one-third as compared with the case in which no film is applied. The gain factor increases 30%. In (2) the threshold current becomes eleven times greater and the gain factor is reduced to one-fourth. These phenomena were analyzed in the light of spontaneous and stimulated lifetime of electrons in the p region. A formula was obtained giving the gain factor as a function of the density of photons and of current. When the current is constant, the gain factor is inversely proportional to  $(P+1)$ , where  $P$  is the density of photons. At the threshold current the gain factor is inversely proportional to the sum of quasi-Fermi levels,  $F_n$  and  $F_p$ . The saturation effect of a light amplifier at a fixed current observed by Crowe and Craig and also the variation of the gain factor with the threshold current can be calculated by this formula. (Author)

**A66-38395**

VELOCITY-PROFILE MEASUREMENT IN PLASMA FLOWS USING TRACERS PRODUCED BY A LASER BEAM.

Che Jen Chen (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.).

*Journal of Applied Physics*, vol. 37, July 1966, p. 3092-3095.  
6 refs.

A giant pulse laser is focused in a gas flow by a lens. The plasma drop produced by the gas breakdown is used as a tracer for the flow velocity measurement. The motion of the plasma drop is detected by both electrostatic probe and drum-camera techniques. The estimated experimental error in the present setup is about 3%. The new features of this method are (1) very high spatial resolution, (2) minimum disturbance in the flow due to the instrumentation, and (3) applicability both to unionized and ionized flows. (Author)

**A66-38396**

GIANT-PULSE LASER ACTIVITY IN NEODYMIUM-DOPED SILICATE GLASS - THE ENERGY CONVERSION PROCESS.

J. H. Wenzel (General Electric Co., Defense Electronics Div., Electronics Laboratory, Syracuse, N.Y.).

*Journal of Applied Physics*, vol. 37, July 1966, p. 3100-3110.  
15 refs.

Research supported by the General Electric Co.

An experiment is reported which relates the gain characteristics of the pulsed mode in a neodymium-doped silicate glass laser to the giant-pulse laser energy output. In this experiment optical pumping of both the pulsed and giant-pulse mode occur in a time short compared to laser atom metastable lifetime. An analysis of the experimental data shows that pulsed-mode gain characteristics can be related to the giant pulse energy output through the use of a model for the giant-pulse laser similar to that derived by Wagner and Lengyel provided that corrections are included to account for the effects of resonator standing waves and gain variations across the radius of the laser rod. (Author)

**A66-38412**

ENERGIES OF IONS PRODUCED BY LASER IRRADIATION.

Susumu Namba, Pil Hyon Kim, and Akira Mitsuyama (Institute of Physical and Chemical Research, Tokyo, Japan).

*Journal of Applied Physics*, vol. 37, July 1966, p. 3330, 3331.

Measurement of the energies of ions generated from a metal surface irradiated by a single giant pulse laser. The surface temperature of the metal target is estimated from the lower of two ion-energy peaks observed. R. A. F.

**A66-38484 #**

MACHINING WITH LASERS.

Clarence F. Luck, Jr. and William Prifti (Raytheon Co., Microwave and Power Tube Div., Laser Advanced Development Center, Waltham, Mass.).

*American Society of Mechanical Engineers, Design Engineering Conference and Show, Chicago, Ill., May 9-12, 1966, Paper 66-MD-28*, 5 p.

Members, \$0.75; nonmembers, \$1.50.

Study of the use of the laser for the controlled removal of metals, ceramics, and even diamond with considerable savings in time and money. Hole drilling and microwelding are two applications discussed. In addition, in many applications where brittle, hard, or otherwise difficult-to-machine materials must be used, the laser is performing successfully with almost no competition from other methods of metalworking. It is pointed out that the future of laser machining will be brighter as initial equipment and operating costs decline. The continued growth of this new technology, improvements on present devices, and the development of totally new lasers will thus insure laser machining a prominent place in tomorrow's industry. M. F.

**A66-38491 #**

LASERS FOR MEASUREMENT.

Robert G. Chamberlain (Giddings and Lewis Machine Tool Co., Fond du Lac, Wis.).

*American Society of Mechanical Engineers, Design Engineering Conference and Show, Chicago, Ill., May 9-12, 1966, Paper 66-MD-43*, 5 p.

Members, \$0.75; nonmembers, \$1.50.

Discussion of applications of the laser, especially as measuring equipment in metalworking. Applications discussed include the length-measuring laser interferometer, the surface-grazing interferometer, a "pointing interferometer" to measure angles, and a laser used as a feedback device on the machine tool itself. Experience with the unit used by the author is reviewed. M. F.

**A66-38528**

LASER-INDUCED LUMINESCENCE AND DISSOCIATION BIPHENYL.

K. B. Eiseenthal, W. L. Peticolas, and K. E. Rieckhoff (International Business Machines Corp., Research Laboratory, San Jose, Calif.).

*Journal of Chemical Physics*, vol. 44, June 15, 1966, p. 4492-4497.  
16 refs.

The interaction of the radiation field of an unfocused ruby laser with molecules containing a phenyl-phenyl or benzyl-benzyl single bond is found to give rise to a new luminescence. This luminescence is linearly dependent on the molecular concentration and proportional to either the second or the third power of the laser intensity. Thus it appears that a multiphoton absorption is occurring. The absorption does not appear to involve the electronic states of the molecules. This luminescence occurs throughout the visible region and bears no resemblance whatever to either the normal fluorescence or phosphorescence. Because of the exceedingly high laser intensities or electric fields necessary for electronic dielectric breakdown it appears that this mechanism is not of importance. It is suggested that multiphoton vibrational excitation to a dissociative state of the molecule may occur which leads to molecular fragmentation. This process is followed by a chemiluminescent emission. A quantitative comparison of the experimental results with a theoretical treatment of multiphoton vibrational dissociation is made. (Author)

**A66-38554**

DEPENDENCE OF SECOND-HARMONIC GENERATION ON THE POSITION OF THE FOCUS.

D. A. Kleinman and R. C. Miller (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

*Physical Review, 2nd Series*, vol. 148, Aug. 5, 1966, p. 302-312.  
17 refs.

The theory of second-harmonic generation (SHG) by focused laser beams is compared with experiment in regard to the dependence of the power on the coherence length [ $L_c = 2\pi/(2k_1 - k_2)$ ] and position of the focus in the crystal. The treatment neglects absorption

and double refraction. It is found that SHG should be strongly peaked when the focus is at either of the crystal surfaces. When the coherence length is positive ( $2k_1 > k_2$ ) there is an oscillatory fine structure as the focus is moved inside the crystal. Experiments using the He-Ne gas laser and crystals of  $\text{LiNbO}_3$  confirm the predictions of the theory. The coherence length in the  $\text{LiNbO}_3$  could be controlled through the temperature. Satisfactory quantitative agreement was obtained between theory and experiment. A quantitative measurement gave the ratio  $d_{33}/d_{31} = 6.0 \pm 1.0$  for  $\text{LiNbO}_3$  at  $1.15 \mu$ . (Author)

**A66-38633**

## NONEQUILIBRIUM QUANTUM STATISTICS - APPLICATION TO THE LASER.

Victor Korenman (Harvard University, Lyman Laboratory of Physics, Cambridge, Mass.).

*Annals of Physics*, vol. 39, Aug. 1966, p. 72-126. 32 refs. NSF-supported research.

A method is presented for describing a general nonequilibrium system in contact with a reservoir in terms of the correlation functions of its quantized field operators. Equations of motion for these correlation functions are derived for a system of multilevel moving atoms interacting with the radiation field, which interacts in turn with the reservoir system. A simple and rigorous description of the influence of a cavity and an optical pump is derived and other types of reservoir coupling are briefly discussed. This description is then applied to a model of a gas laser. The breakdown of the linear theory at the usual lasing threshold suggests consideration of nonlinear terms, which are developed in an expansion in the field strength. Using only the first nonlinear term we find the equations of Lamb by examining the stability of pure modes of the radiation field. A further discussion of the laser is presented in which the presence of a pure mode is not assumed. It is shown that while a simple incoherent perturbation theory gives divergences, a more self-consistent calculation taking partial coherence into account gives the same results plausible by pure mode theory. (Author)

**A66-38763 #**HYPERFINE SPECTRUM OF XENON IN THE  $3.5\text{-}\mu\text{m}$  MASER TRANSITION.

Katsumi Sakurai and Koichi Shimoda (Tokyo, University, Dept. of Physics, Tokyo, Japan).

*Physical Society of Japan, Journal*, vol. 21, June 1966, p. 1214.

Investigation of the spectrum of the  $3.51\text{-}\mu\text{m}$  transition of xenon. The emission spectra of one discharge tube was measured with an IR beam from a maser oscillator which was magnetically tuned. The experimental facility is illustrated, the observed gain profiles under low- and high-input power levels are shown, and the theoretical structure of the hyperfine structure  $F \rightarrow F'$  (mass) is plotted.

B. B.

**A66-38796 #**

## PHOTOGRAPHIC RADAR.

R. H. Christie (United Kingdom Atomic Energy Authority, Atomic Weapons Research Establishment, Aldermaston, Berks., England). (Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

*Journal of Scientific Instruments*, vol. 43, Aug. 1966, p. 524-527. 8 refs.

Description of a photographic radar system employing a Q-switched ruby laser, a Mullard type 6929 image tube, and a conventional camera. The operation of the system is described, and photographs obtained with and without time-gating are shown. D.H.

**A66-38920 #**

## THEORY OF OPTICALLY COUPLED LASERS USING A GaAs p-n JUNCTION [K TEORII OPTICHESKI SVIAZANNYKH LAZEROV NA p-n-PEREKHODE GaAs].

Iu. P. Zakharov, V. V. Nikitin, A. S. Semenov, A. V. Uspenskii, and V. A. Shcheglov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*Fizika Tverdogo Tela*, vol. 8, July 1966, p. 2087-2091. 6 refs. In Russian.

Experimental investigation of optical coupling with the aid of a GaAs laser in the form of a "double unit" that provides electrical isolation between two p regions by having a channel etched in the p-side of the diode parallel to the reflecting ends. It is shown that the presence of optical coupling between the two parts of the diode makes it possible to vary the frequency of diode emission at a small change in current density over the smaller part of the diode.

V. P.

**A66-38930**

## FOKKER-PLANCK EQUATION, DISTRIBUTION AND CORRELATION FUNCTIONS FOR LASER NOISE.

H. Risken, C. Schmid, and W. Weidlich (Stuttgart, Technische Hochschule, Institut für theoretische und angewandte Physik, Stuttgart, West Germany).

*Zeitschrift für Physik*, vol. 194, no. 4, 1966, p. 337-359. 24 refs.

As an application of a preceding paper we set up a Fokker-Planck equation with quantum mechanically defined dissipation and fluctuation coefficients for a distribution function of the atomic variables (dipole moments and level occupation numbers) as well as of the lasing light amplitude in a laser with a homogeneously broadened line. Since the nonlinear coefficients can be linearized in appropriate coordinates well below and well above threshold, the equation can be solved with the Wang-Uhlenbeck method. Then it is easy to obtain correlation functions, spectral densities and expressions for linewidth. (Author)

**A66-38955 #**

## GALLIUM ARSENIDE SEMICONDUCTOR LASER WITH A PLANE RESONATOR [POLUPROVODNIKOVYI KVANTOVYI GENERATOR NA ARSENIDE GALLIIA S PLOSKIM REZONATOROM].

N. G. Basov, O. V. Bogdankevich, V. A. Goncharov, B. M. Lavrushin, and V. Iu. Sudzilovskii (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*Akademiia Nauk SSSR, Doklady*, vol. 168, June 21, 1966, p. 1283-1286. 10 refs. In Russian.

Discussion of the performance of a laser using a resonator with a mirror area  $\gg L$  (intermirror distance). The dependence of the forbidden zone width on the free carrier concentration and the dependence of the absorption coefficient on the energy of an incident photon are determined. The experimental technique is described, and the observed results are given a theoretical interpretation.

V. Z.

**A66-38956 #**

## CHANGE IN THE GENERATION CHANNELS OF A FOUR-LEVEL LASER [IZMENENIE KANALA GENERATSII V CHETYREKHUROVNEVOM KVANTOVOM GENERATORE].

B. I. Stepanov (Akademiia Nauk Belorusskoi SSR, Institut Fiziki, Minsk, Belorussian SSR).

*Akademiia Nauk SSSR, Doklady*, vol. 168, June 21, 1966, p. 1294-1297. 5 refs. In Russian.

Analysis of the process of interchannel generation transfer and of multichannel generation in a laser with four unsplit levels, assuming that the probability of the nonoptical transitions  $3 \rightarrow 4$ ,  $2 \rightarrow 4$ ,  $1 \rightarrow 4$ ,  $2 \rightarrow 3$ , and  $1 \rightarrow 3$  is zero. The radiation density for the channels  $3 \rightarrow 2$ , and  $3 \rightarrow 1$  is determined. The effects of temperature and of variations in the coefficients of losses are considered.

V. Z.

**A66-39105 #**

## AN ANISOTROPIC REFLECTOR FOR LASERS.

Iu. I. Kruzhilin.

*Optika i Spektroskopiia*, vol. 20, Apr. 1966, p. 713-715.)

*Optics and Spectroscopy*, vol. 20, Apr. 1966, p. 397, 398. Translation.

[For abstract see issue 16, page 2721, Accession no. A66-31803]

**A66-39108****RECIRCULATING LIQUID LASER.**

Erhard J. Schimitschek, Richard B. Nehrich, and John A. Trias (U.S. Navy, Electronics Laboratory, San Diego, Calif.).  
Applied Physics Letters, vol. 9, Aug. 1, 1966, p. 103, 104.

Description of a method for solving the problem of repeated flashing posed by the nonuniform heating with each flash of liquid media used for europium chelate lasers. This limitation was overcome by recirculating the liquid through the cell and an external heat exchanger. Laser repetition rates of one flash per second could thus be achieved. Since the threshold energies for the moving liquid were only slightly higher than for the stationary one, any turbulence created by the flowing process was insignificant. The results obtained showed that, with improved equipment, it seems very likely that larger volumes of recirculating laser liquid can be efficiently excited. M.M.

**A66-39109****MODE COUPLING IN AN EXTERNAL RAMAN RESONATOR.**

R. H. Pantell, B. G. Huth, H. E. Puthoff, and R. L. Kohn (Stanford University, Stanford, Calif.).

Applied Physics Letters, vol. 9, Aug. 1, 1966, p. 104-106. 8 refs. Army-USAF-Navy-supported research.

Discussion of the first observation of coupling of adjacent axial modes in an external Raman resonator. This coupling was observed at the first Stokes frequency with benzene as the Raman medium and a Q-switched ruby laser as the pump source. The observation of such coupling in connection with the stimulated Raman effect means that the production of nanosecond and subnanosecond spikes of coherent oscillation throughout the visible and IR spectrum is now possible, because of the large numbers of frequencies obtainable from a host of materials by means of the stimulated Raman effect. M.M.

**A66-39110****A HIGH-GAIN ROOM-TEMPERATURE LIQUID LASER - TRIVALENT NEODYMIUM IN SELENIUM OXYCHLORIDE.**

Adam Heller (General Telephone and Electronics Laboratories, Inc., Bayside, N.Y.).

Applied Physics Letters, vol. 9, Aug. 1, 1966, p. 106-108. 16 refs.

Description of the characteristics of trivalent neodymium in selenium oxychloride, an inorganic liquid laser that does not have the limitations of the europium chelates and that matches in threshold and output the best known solid-state laser materials such as neodymium-doped crystals or ruby. The solution to the problem of radiationless relaxation in excited neodymium ions in liquids was based on the work of Hutchinson and Magnuson and of Wright, Robinson, and Frosh. The characteristics of the neodymium ion in solution approximate those of the ion in crystalline lattices rather than in glasses as indicated by the rigorously exponential decay (110  $\mu$ sec) and by the laser characteristics. M.M.

**A66-39111****CHARACTERISTICS OF THE Nd<sup>3+</sup>:SeOCl<sub>2</sub> LIQUID LASER.**

Alexander Lempicki and Adam Heller (General Telephone and Electronics Laboratories, Inc., Bayside, N.Y.).

Applied Physics Letters, vol. 9, Aug. 1, 1966, p. 108-110.

Description of the performance characteristics of a new room-temperature liquid laser using the Nd<sup>3+</sup>:SeOCl<sub>2</sub> system. The unusual properties of this laser are its high gain and sharpness of emission, more characteristic of crystalline hosts than glass lasers. Furthermore, the moderate absorbance and low threshold of this system permit the exploitation of the potential advantages of the liquid medium for high-energy pulse or CW operation. M.M.

**A66-39112****MODULATION OF 10.6- $\mu$  LASER RADIATION BY ULTRASONIC DIFFRACTION.**

H. R. Carleton and R. A. Soref (Sperry Rand Corp., Sperry Rand Research Center, Sudbury, Mass.).

Applied Physics Letter, vol. 9, Aug. 1, 1966, p. 110-112. 6 refs.

Description of the ultrasonic diffraction of 10.6- $\mu$  laser radiation by the photoelastic effect in CdS, GaAs, and Si crystals. Modulation depths of 0.5% were obtained for acoustic power densities of 12 W/cm<sup>2</sup> at an ultrasonic carrier frequency of 20 Mc. The corresponding photoelastic coefficients of these materials are derived from the measurements. The results obtained are summarized in a table, where the percent modulation of the forward-scattered beam, the photoelastic coefficient, and the diffracting power of each material are recorded.

**A66-39114****EFFICIENT ULTRAVIOLET LASER EMISSION IN ELECTRON-BEAM-EXCITED ZnS.**

C. E. Hurwitz (Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.).

Applied Physics Letters, vol. 9, Aug. 1, 1966, p. 116-118. 7 refs. USAF-supported research.

Description of the characteristics of efficient semiconductor lasers in the UV portion of the spectrum that were obtained at both liquid helium and nitrogen temperatures using pulsed electron beam excitation on crystals of ZnS. Peak output power of up to 1.7 watts, with a power efficiency of 6.5% was measured in the spectral range from 3245 to 3300 Å. By analogy with the results in CdS<sub>x</sub>Se<sub>1-x</sub>, this observation of efficient laser action in ZnS indicates that it also should be possible to produce efficient lasers of the ternary compound Zn<sub>x</sub>Cd<sub>1-x</sub>S, thus extending to 3245 Å the continuous wavelength range of efficient semiconductor lasers. M.M.

**A66-39115****OPTICAL SPECTRA OF ULTRASHORT OPTICAL PULSES GENERATED BY MODE-LOCKED GLASS:Nd LASERS.**

D. A. Stetser and A. J. DeMaria (United Aircraft Corp., Research Laboratories, East Hartford, Conn.).

Applied Physics Letters, vol. 9, Aug. 1, 1966, p. 118-120. 7 refs.

Evaluation of the temporal and spectral characteristics of normal, Q-switched, and simultaneous Q-switched and mode-locked pulses from a 12.2-by-0.95-cm Brewster-ended glass-Nd rod. It is shown that the spectra of a normal laser output were found to be approximately 30 Å wide and nonuniformly distributed as a function of wavelength. The Kerr cell Q-switch type of operation yielded a uniform spectral width of approximately 50 Å. The simultaneous Q-switched and mode-locked operation with the saturable absorber cell placed parallel to the Fabry-Pérot reflectors yielded a channeled spectrum approximately 100 Å in width. The increase in spectral width resulted from the tendency of the saturable absorber-expander element to distribute the energy evenly throughout the spectral line width of the laser medium by the generation of side bands at the resonances of the Fabry-Pérot interferometer. A channeled spectrum was obtained because of the mode selectivity of the glass-air-dye interfaces of the cell. M.M.

**A66-39116****INTERACTION BETWEEN AXIAL MODES OF A ZEEMAN LASER.**

J. Kannelaud and W. Culshaw (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Research Laboratories, Palo Alto, Calif.).

Applied Physics Letters, vol. 9, Aug. 1, 1966, p. 120-123. 10 refs. Research supported by the Lockheed Independent Research Program.

Description of strong interactions, including quenching phenomena, which were found between oscillations on two axial modes of a short planar laser operating on well resolved, oppositely circular polarized Zeeman components of the J = 1 - 0, 2.65- $\mu$  laser transition of Xe in an axial magnetic field. Quenching and hysteresis effects between the Zeeman oscillations on a single axial mode were also observed in near-zero magnetic fields, but no hysteresis was observed in the interactions between two axial modes of the laser. Such results are significant for current theoretical work on the Zeeman laser and on collision effects, since the transition is amenable to analysis, and the small Doppler width of 160 Mc/sec for an atomic temperature of 500°K means that the Doppler parameter  $ku$  in Lamb's theory becomes comparable with the atomic response involved in the laser emission. M.M.

**A66-39118**

LASER CAVITY DUMPING USING TIME VARIABLE REFLECTION.  
W. R. Hook, R. H. Dishington, and R. P. Hilberg (TRW, Inc., TRW Systems Group, Redondo Beach, Calif.).  
*Applied Physics Letters*, vol. 9, Aug. 1, 1966, p. 125-127.

Description of the successful operation of a neodymium laser oscillator using a time-variable reflector. It has been demonstrated that it is possible to "load" an optical cavity with nearly the maximum safe amount of energy, using a conventional Q-switching sequence, and then to dump all that energy in a time limited only by the cavity length. The characteristics of the several optical and switching pulses generated by the experimental system were measured and found to be in substantial agreement with those characteristics which can be predicted using a simple cavity-draining model. Similar results were obtained with both calcium tungstate and glass rods. M.M.

**A66-39164**

SELF-INDUCED DIVERGENCE OF CW LASER BEAMS IN LIQUIDS - A NEW NONLINEAR EFFECT IN THE PROPAGATION OF LIGHT.  
Klaus E. Rieckhoff (Simon Fraser University, Dept. of Physics, Burnaby, British Columbia, Canada).  
*Applied Physics Letters*, vol. 9, July 15, 1966, p. 87, 88. 9 refs.  
Research supported by the Defence Research Board of Canada and the National Research Council of Canada.

Discussion of a new nonlinear effect which results from a macroscopic change in the propagation properties of a medium due to the presence of a light beam and which, moreover, seriously changes these properties at light intensities on the order of milliwatts only. It was observed that the beam of He-Ne CW laser experiences an intensity-dependent spread when traversing a transparent liquid. This effect is the result of a temperature gradient and hence a density gradient set up in the liquid by the laser beam. The thermal nature of the effect is easily demonstrated by a sudden change in laser power or beam position. In either case it takes many seconds until a new steady state is established. The accommodation of the beam diameter to its new steady state can be observed by the eye. M.M.

**A66-39165**

BEHAVIOR OF CdS CRYSTALS UNDER LASER LIGHT EXCITATION.  
Keiji Maeda and Seishi Iida (Tokyo Shibaura Electric Co., Toshiba Central Research Laboratory, Kawasaki, Japan).  
*Applied Physics Letters*, vol. 9, July 15, 1966, p. 92-94. 6 refs.

Discussion of the photoconductive and luminescent behavior of undoped CdS single crystals at room temperature under laser excitation. This strong excitation induces saturation, together with the appearance of a fast decay component in photoconductivity and a superlinearity in luminescence hitherto unobserved. A model is proposed to explain the results obtained. M.M.

**A66-39166**

MOLECULAR LASER ACTION IN NITRIC OXIDE BY PHOTODISSOCIATION OF NOCl.  
M. A. Pollack (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

*Applied Physics Letters*, vol. 9, July 15, 1966, p. 94-96. 10 refs.

Description of the observation of vibrational excitation of NO at fifteen wavelengths between 5.95 and 6.30  $\mu$  due to the photodissociation of NOCl. The lines were identified as vibrational-rotational (V-R) transitions of the NO ground electronic state. The total laser output obtained is shown, together with the flash lamp pumping pulse. The oscillation started 7  $\mu$ sec after the initiation of the pump pulse and lasted for about 4  $\mu$ sec. Total peak powers of 10 watts were coupled out of the resonator, with 1000 joules discharged into the flash lamp. It is noted that the laser action terminated long before all the energy of the capacitor bank was discharged. Optimum NOCl pressure is about 1 torr in a buffer of 100 torr of helium. M.M.

**A66-39224**

TRANSIENT-ANALYSIS APPROACH TO THE LASER AMPLIFIER.  
Nobuaki Kumagai and Hei-Ichi Yamamoto (Osaka University, Faculty of Engineering, Osaka, Japan).  
*Electronics and Communications in Japan*, vol. 48, June 1965, p. 10-17. 5 refs. Translation.

Unified theory of the laser amplifier using the model of a three-layer (air/active-layer/air) Fabry-Pérot interferometer. The salient point of the present theory, compared with earlier ones, is that the analysis, based on the Laplace transform technique, makes possible the inclusion of transient effects in the solutions. The theory is therefore applicable to amplifiers in the stable region and oscillators in the unstable region. The analysis predicts self-oscillation of the system in the unstable region, and the frequency of such self-oscillation is dependent only on the system parameters and not on the incident signal frequency. Design criteria for maximum gain and the gain-bandwidth relation are discussed. M.L.

**A66-39301 #**

WAVE SYNCHRONIZATION IN A GAS LASER WITH A RING RESONATOR CAVITY [O SINKHORIZATSII VOLN V GAZOVOM LAZERE S KOL'TSEVYM REZONATOROM].  
Iu. N. Klimontovich, V. N. Kuriatov, and P. S. Landa (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR).  
*Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, vol. 51, July 1966, p. 3-12. 7 refs. In Russian.

Discussion of the synchronization of two opposite waves in a ring laser, in the case of possible frequency mismatch of the waves. The zero and first harmonics of the density-matrix elements are taken into account in the calculation of the polarization vector. A formula for the width of the synchronization band is derived, taking into account the second-order terms in the expression for the mirror-reflection coefficient. The theoretical dependence of the width of the synchronization band on the magnitude and phase of the reflection coefficient is compared with the results of an experiment in which the reflection coefficient was varied with the aid of additional mirrors. V.P.

**A66-39303 #**

INTERACTION OF LASER MODES DURING MODULATION OF THE RESONATOR Q FACTOR [VZAIMODEISTVIE MOD LAZERA PRI MODULATSII DOBROTNOSTI REZONATORA].  
L. N. Magdich.  
*Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, vol. 51, July 1966, p. 18-24. 7 refs. In Russian.

Discussion of mode-locking phenomena during modulation of the resonator Q factor. It is shown that consideration of the mode pulling effect of the Doppler-line center leads to a minimum modulation depth for which synchronization is possible. It is also shown that the analysis of a two-mode laser can be reduced to the classical problem of the synchronization of a self-excited oscillator by an external signal, which can be solved by successive simplification techniques. Using this method, it is possible to determine the synchronization region for an arbitrary number of laser modes. V.P.

**A66-39305 #**

INVESTIGATION OF COLLISION PROCESSES INVOLVING EXCITED ATOMS IN GAS LASERS [ISSLEDOVANIYE PROTSESSOV STOLKNOVENIY S VOZBUZHDENNYMI ATOMAMI V GAZOVYKH OKG].  
A. S. Khaikin (Akademiya Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, vol. 51, July 1966, p. 38-48. 14 refs. In Russian.

Development of a method for studying various excitation-transfer processes in the plasma of gas lasers. It is shown that the method proposed makes it possible to measure directly the quantities  $\langle \sigma \rangle$  for electron and atom collisions with excited atoms and also to measure the probability characteristics for transitions between excited levels of atoms. V.P.

**A66-39306 #**

INVESTIGATION OF THE STIMULATED RADIATION OF  $Y_3Al_5O_{12}-Nd^{3+}$  CRYSTALS [ISSLEDOVANIIE INDUTSIROVANNOGO IZLUCHE-NIYA KRISTALLOV  $Y_3Al_5O_{12}-Nd^{3+}$ ].

A. A. Kaminskii (Akademiia Nauk SSSR, Institut Kristallografii, Moscow, USSR).

*Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, vol. 51, July 1966, p. 49-58. 13 refs. In Russian.

Theoretical and experimental investigation of the stimulated radiation, absorption spectra, and luminescence of neodymium-activated yttrium-aluminum garnet. The results are used to construct a scheme for the levels of the  $^4F_{3/2}$  and  $^4I_{11/2}$  terms for temperatures of 300 and 77°K. The scheme is compared with the induced transitions observed. Pulsed lasers and lasers with continuous and quasi-continuous operation are described. V. P.

**A66-39308 #**

APPLICATION OF GAS LASERS TO THE DETERMINATION OF ATOM CHARACTERISTICS [PRIMENENIE GAZOVYKH LAZEROV DLIA OPREDELENIYA ATOMNYKH KHKARAKTERISTIK].

A. K. Popov (Akademiia Nauk SSSR, Sibirskoe Otdelenie, Institut Fiziki, Krasnoyarsk, USSR).

*Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, vol. 51, July 1966, p. 121-128. 7 refs. In Russian.

Derivation of an expression for the dependence of the frequency and emitted power of a gas laser on the resonator tuning and the length of the plasma filament. The expression is obtained in a coordinate system that is not coupled to the moving particles, on the basis of equations for the density matrix and for constant excitation conditions. The results obtained are seen to be valid for an arbitrary ratio of the dispersion width of the line profile to the Doppler width. The analysis takes into account the degeneration of the operating levels, the relaxation transitions between these levels, a self-consistent mechanism of filling the lower operating level from the metastable level. Some characteristics of atoms interacting with the radiation are obtained from a comparison of the theoretical and experimental results. V. P.

**A66-39336 #**

PENCIL LASER IN THE INFRARED REGION [PUCHKOVYI KVANTOVYI GENERATOR INFRAKRASNOGO DIAPAZONA].

N. G. Basov, A. I. Oraevskii, and V. A. Shcheglov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*ZHETI Pis'ma v Redaktsiiu*, vol. 4, July 15, 1966, p. 61-62. In Russian.

Method for IR pencil laser generation, using thermal excitation. The method is most suitable in the wavelength region from 3 to 20  $\mu$ . R. A. F.

**A66-39385**

LASER USED FOR MASS ANALYSIS.

N. C. Fenner and N. R. Daly (United Kingdom Atomic Energy Authority, Aldermaston, Berks., England).

*Review of Scientific Instruments*, vol. 37, Aug. 1966, p. 1068-1070. 9 refs.

The focused beam from a "giant pulse" laser has been used to vaporize and ionize thin samples of solid material and so provide the ion source of a time-of-flight mass spectrometer. Ions produced in this way have an energy spread of 0-500 v, and this has necessitated employing an energy filter to obtain a resolution of about 30. Samples of  $10^{-7}$ g from metal foils have been successfully analyzed and have shown comparable ionization efficiencies for a large number of metals. When this technique was applied to the analysis of crystals of organic compounds, only atomic ions were observed and although the ionization efficiency of the metal atoms is again comparable, the efficiency of the other components depends critically on the power of the laser beam. (Author)

**A66-39394**

THEORY OF INTERFEROMETRIC ANALYSIS OF LASER PHASE NOISE.

J. A. Armstrong (International Business Machines Corp., Thomas J. Watson Research Center, Yorktown Heights, N. Y.).

*Optical Society of America, Journal*, vol. 56, Aug. 1966, p. 1024-1031. 14 refs.

Contract No. DA-31-124-ARP-D-205.

The line width of a well-stabilized laser operating far above threshold is determined by random fluctuations of the phase. This paper discusses several types of experiments which can give information about the details of this phase random process. The various properties of the derived intensity noise which may be determined are its probability density, first and second moments, autocorrelation function, and spectrum. These measurable quantities depend on two factors; the first and more fundamental is the joint probability distribution for the change in phase in a given time. The second factor is the manner of operation of the interferometer in changing phase to intensity noise. We discuss both two-beam and multiple-beam interferometers and derive theoretical expressions for the above-mentioned properties of the output intensity fluctuations. It is interesting that although in both cases the output intensity fluctuations are non-Gaussian random processes, it is nevertheless possible to derive a number of useful theoretical results. (Author)

**A66-39541**

LASER BIBLIOGRAPHY. III.

K. Tomiyasu (General Electric Co., Schenectady, N. Y.).

*IEEE Journal of Quantum Electronics*, vol. QE-2, June 1966, p. 124-151.

This laser bibliography, compiled during the period from July through December, 1965, contains 644 references which are divided into 25 subject categories and listed chronologically. Brief annotations are added to many references. Twenty-seven references dealing with holograms are listed. (Author)

**A66-39542**

NONLINEAR AMPLIFICATION OF LIGHT PULSES.

N. G. Basov, R. V. Ambartsumian, V. S. Zuev, P. G. Kriukov, and V. S. Letokhov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, vol. 50, Jan. 1966, p. 23-34.)

*Soviet Physics - JETP*, vol. 23, July 1966, p. 16-22. 19 refs.

Translation.

[For abstract see issue 10, page 1543, Accession no. A66-21963]

**A66-39545**

MANY-PHOTON IONIZATION OF THE XENON ATOM BY RUBY LASER RADIATION.

G. S. Voronov and N. B. Delone (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, vol. 50, Jan. 1966, p. 78-84.)

*Soviet Physics - JETP*, vol. 23, July 1966, p. 54-58. 8 refs. Translation.

[For abstract see issue 10, page 1543, Accession no. A66-21966]

**A66-39549**

AN OPTICAL RESONATOR FOR A LASER WITH A LIQUID ACTIVE SUBSTANCE.

V. P. Bykov.

*(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, vol. 50, Jan. 1966, p. 140-143.)

*Soviet Physics - JETP*, vol. 23, July 1966, p. 94-96. Translation. [For abstract see issue 10, page 1543, Accession no. A66-21970]

**A66-39569 #**

ABSORPTION SPECTRUM OF OPTICALLY PUMPED RUBY. I - EXPERIMENTAL STUDIES OF SPECTRUM IN EXCITED STATES. Takashi Kushida (Tokyo Shibaura Electric Co., Ltd., Toshiba Central Research Laboratory, Kawasaki, Japan). *Physical Society of Japan, Journal*, vol. 21, July 1966, p. 1331-1341. 19 refs.

Absorption transitions between two excited optical states in ruby have been studied by comparing the absorption coefficients measured under optically pumped and unpumped conditions. The spectrum has been determined in the  $\pi$ - and  $\sigma$ -polarizations in the photon energy range from 5500 to 45,000  $\text{cm}^{-1}$ . Several absorption bands have been found which arise from the transitions from the excited states  $t_{2g}^3 2E_g$  and  $t_{2g}^3 2T_{1g}$  of the  $\text{Cr}^{3+}$  ion. From the locations and intensities of these bands, the terminal states of the observed transitions are assigned to the charge transfer state, the  $t_{2g}^3 2T_{2g}$  state, and the doublet states belonging to the electron configuration  $t_{2g}^2 e_g$ . Calculated energies between these states and the metastable states,  $t_{2g}^3 2E_g$  and  $t_{2g}^3 2T_{1g}$ , are in good agreement with the peak energies of the observed absorption bands. The present experiment gives new information inaccessible by the ordinary ground state absorption measurement, such as the locations of several doublet states with the configuration  $t_{2g}^2 e_g$  and the intensities of doublet-doublet transitions in ruby. (Author)

**A66-39570 #**

ABSORPTION SPECTRUM OF OPTICALLY PUMPED RUBY. II - THEORETICAL ANALYSES. Masaki Shinada, Satoru Sugano (Tokyo University, Institute for Solid State Physics, Tokyo, Japan), and Takashi Kushida (Tokyo Shibaura Electric Co., Ltd., Toshiba Central Research Laboratory, Kawasaki, Japan). *Physical Society of Japan, Journal*, vol. 21, July 1966, p. 1342-1352. 12 refs.

Research supported by the Sakkokai Foundation.

The absorption spectrum in the excited states of ruby reported by Kushida is analyzed on the basis of the crystalline field or ligand field theory. Remarkably sharp absorption peaks observed in the infrared region are identified to the  $t_{2g}^3 2E_g \rightarrow t_{2g}^3 2T_{2g}$  transitions, and a temperature-sensitive broad band also in this region is identified to the  $t_{2g}^3 2T_{1g} \rightarrow t_{2g}^3 2T_{2g}$  transitions. Several broad peaks observed in the visible region are assigned to the  $t_{2g}^3 2E_g \rightarrow t_{2g}^2 ({}^3T_{1g}) e_g 2T_{2g}$ ,  $t_{2g}^2 ({}^1T_{2g}) e_g 2T_{1g}$ ,  $t_{2g}^2 ({}^3T_{1g}) e_g 2T_{1g}$ ,  $t_{2g}^2 ({}^1T_{2g}) e_g 2T_{2g}$  transitions. Unidentified broad peaks in the infrared region are discussed in some detail with the assumption that they are due to the phonon-induced electric dipole transitions. (Author)

**A66-39653 #**

SYNCHRONIZATION OF LASER PEAK REGIMES [O SINKHRONIZATSII PICHKOVOGO REZHIMA KVANTOVYKH GENERATOROV]. V. N. Morozov and A. N. Oraevskii (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR). *Radiofizika*, vol. 9, no. 4, 1966, p. 710-714. 9 refs. In Russian.

Theoretical analysis of laser regimes in which the Q factor depends periodically on time. It is shown that if the modulation depth of the Q factor exceeds a certain threshold value, continuous pulsations of the radiation power occur in the laser. It is established that stable limiting cycles can be produced by small nonlinear losses and that these limiting cycles can be regarded as the result of mutual synchronization of phase-shifted oscillation modes. A. B. K.

**A66-39654 #**

FREQUENCY DOUBLING OF THE LIGHT EMITTED BY A LASER WITH A Q-SWITCHED RESONATOR [K VOPROSU OB UDVOENII CHASTOTY SVETA, IZLUCHAEMOGO OKG S PEREKLIUCHENIEM DOBROTNOSTI REZONATORA]. V. I. Bespalov and Iu. K. Bogatyrev (Gor'kovskii Gosudarstvennyi Universitet, Nauchno-Issledovatel'skii Radiofizicheskii Institut, Gorki, USSR). *Radiofizika*, vol. 9, no. 4, 1966, p. 715-719. In Russian.

Numerical solution of the problem of frequency doubling of the light emitted by a laser with a variable resonator Q factor. The cases where the nonlinear frequency converter is placed inside the resonator and outside of it are both considered. A solution is obtained for a system of differential equations describing the processes occurring in a three-level laser, the resonator of which contains a nonlinear absorber. A. B. K.

**A66-39662 #**

REORIENTATION OF MOLECULES IN A BEAM MASER USING FORMALDEHYDE [K VOPROSU O PEREORIENTATSII MOLEKUL V PUCHKOVOM MAZERE NA FORMAL'DEGIDE]. A. F. Krupnov and V. A. Skvortsov (Gor'kovskii Gosudarstvennyi Universitet, Nauchno-Issledovatel'skii Radiofizicheskii Institut, Gorki, USSR). *Radiofizika*, vol. 9, no. 4, 1966, p. 827, 828. In Russian.

Experimental investigation of the reorientation processes in a molecular-beam maser employing the  $1_{01}-0_{00}$  transition of  $\text{CH}_2\text{O}$ . The dependence of the excitation parameter (i.e., the probability of molecule transition at a constant beam and sorting voltage on the voltage in the ring employed as the field-inducing electrode. It is found that even an uncharged ring tends to decrease the excitation parameter. At different signs of the voltage in the sorting system and the ring, the dependence of the excitation parameter on the ring voltage is in agreement with the theoretical expectation - the excitation parameter changes by roughly a factor of 3, which is an indication for a nearly 100% reorientation. At equal signs of the voltages, the excitation parameter undergoes a weak and monotonic variation, an explanation for which is seen the far less abrupt change in the nature of the field at the ring. It is found that the reorienting effect of the ring can be fully eliminated by applying a potential to the ring that is equal to the potential created by the scattering field in the proximity of the ring. V. P.

**A66-39666**

MULTIMODE PROPERTIES OF VARIOUS SEMICONDUCTOR LASER MODELS. I [MULTIMODE-EIGENSCHAFTEN VERSCHIEDENER HALBLEITERLASERMODELLE. I]. Hartmut Haug (Stuttgart, Technische Hochschule, Institut für theoretische und angewandte Physik, Stuttgart, West Germany). *Zeitschrift für Physik*, vol. 194, no. 5, 1966, p. 482-506. 17 refs. In German.

Theoretical study of the optical properties of various models of semiconductor laser transitions. An equation for the intensities and frequencies of laser modes is given for general optical transitions between bands. Models of transitions with and without a k-selection rule are treated as special cases. Assuming that the emission band for transitions with k-selection is inhomogeneously broadened, a mutual influence of two laser modes is found which is similar to that of a conventional laser with an inhomogeneous line. In the case of a model with no selection rule the intensity of one laser mode is calculated for a given inversion. It is found that the lack of a selection rule produces a homogenization and that this effect highly favors the single-mode operation in the case of continuous modes. A. B. K.

**A66-39706**

BEAM LASER FOR THE INFRARED BAND. N. G. Basov, A. I. Oraevskii, and V. A. Shcheglov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR). (ZHETF Pis'ma v Redaktsiiu, vol. 4, July 15, 1966, p. 61, 62.) *JETP Letters*, vol. 4, July 15, 1966, p. 41, 42. Translation. [For abstract see issue 21, category 16, Accession no. A66-39336]

**A66-39711****ON THE THEORY OF SINGLE-PULSE LASER OPERATION.**

Iu. A. Anan'ev, I. F. Balashov, and A. A. Mak.

(Akademiia Nauk SSSR, Doklady, vol. 166, Feb. 1, 1966, p. 825-828.)

Soviet Physics - Doklady, vol. 11, Aug. 1966, p. 124-126. 9 refs.

Translation.

[For abstract see issue 12, page 1889, Accession no. A66-23667]

**A66-39715****STATISTICAL MODELS FOR LASER-INDUCED IONISATION OF GASES.**

J. W. Gardner (English Electric Co., Ltd., Whetstone, Leics., England).

Electronics Letters, vol. 2, Aug. 1966, p. 297, 298. 14 refs.

Argument in favor of replacing Poisson distribution in laser intensity by Polya distribution. The Poisson (random) distribution of photons does not consider the possibility of correlation between coherent photons, while Polya probabilities do. Thus, Poisson distribution overestimates the lowest threshold flux required to induce ionization breakdown. High threshold fluxes coincide in both Poisson and Polya models and also agree with experimental data. Poisson and Furry distributions may be considered as special cases of Polya distribution. Calculation formulas and a table of Polya probabilities are included.

W.A.E.

**A66-39718****SIMPLE ALIGNMENT PROCEDURE FOR A HELIUM-NEON LASER [UNE METHODE SIMPLE D'ALIGNEMENT D'UN LASER A HELIUM-NEON].**

J. F. Delpech (Paris, Université, Institut d'Electronique Fondamentale, Orsay, Seine-et-Oise, France).

Electronics Letters, vol. 2, Aug. 1966, p. 302, 303. In French.

Description of a simple alignment procedure for a gas laser by which, in a few minutes, an alignment sufficiently accurate for oscillation to occur on the three lines of a helium-neon laser can be obtained. An infrared detector and a selective amplifier are the only pieces of equipment required. A block diagram of the method is included.

W.A.E.

**A66-39743****FAR FIELD PATTERN OF INJECTION LASERS AND DIELECTRIC GRADIENT IN THE INVERSION LAYER.**

J. E. Ludman (USAF, Office of Aerospace Research, Cambridge Research Laboratories, Bedford, Mass.) and K. M. Hergenrother (Northeastern University, Dept. of Electrical Engineering, Boston, Mass.).

Solid-State Electronics, vol. 9, Sept. 1966, p. 863-869.

The light emission of GaAs diode lasers contains not only the usual mode pattern of lines normal to the junction, but also a superimposed fine structure of lines parallel to the junction. This fine structure has often been noted but never satisfactorily explained. The characteristics of these lines have been measured and a novel causal mechanism based on geometric optics is proposed. The line spacing was theoretically determined to be a function of the length of the laser diode and measurements on a number of diodes of different lengths were made to confirm the theory. (Author)

**A66-39750****ONE- AND TWO-MICRON INJECTION LASERS.**

H. F. Quinn and G. W. Manley (International Business Machines Corp., Federal Systems Div., Washington Systems Center, Bethesda, Md.).

Solid-State Electronics, vol. 9, Sept. 1966, p. 907-909. 5 refs.

Description of the preparation and properties of new injection lasers obtained from epitaxial single crystals in the quasi-binary III-V compound semiconductor  $\text{In}(\text{P}_{1-x}\text{As}_x)$ . The peak of the spontaneous emission from these diodes at 77°K, when driven with 10-μsec current pulses of amplitude 2A at a repetition rate of 1 kc, varied from 2.03 to 2.13 μ. The width at half-amplitude was 1400 Å. Using a 50-nsec current pulse at 60 pps, stimulated emission

was observed at 77°K from all the diodes, the peaks ranging from 2.02 to 2.04 μ. Two diodes exhibited identical threshold current densities of 40 kamp/cm<sup>2</sup>.

M.M.

**A66-39763 #****EFFECT OF HIGH-INTENSITY LIGHT FLUXES ON METALS [DEISTVIE MOSHCNYYKH SVETOVYKH POTOKOV NA METALLY].**

S. I. Anisimov, A. M. Bonch-Bruевич, M. A. El'iashevich, Ia. A. Imas, N. A. Pavlenko, and G. S. Romanov.

Zhurnal Tekhnicheskoi Fiziki, vol. 36, July 1966, p. 1273-12 4. 9 refs. In Russian.

Theoretical and experimental investigation of the basic phenomena that take place in a metal subjected to laser radiation. It is shown that the disintegration process of metals under the effect of a laser beam can be divided into several phases. In the first phase, the metal is heated at a rate of ~10<sup>10</sup> degrees per sec; in the second, the beam penetrates deeper and the metal begins to evaporate; and in the third phase (characterized by the formation of marked indentation and the accumulation of dense metal vapor in it), there forms an intense vapor stream that washes the liquid metal from the walls.

V.P.

**A66-39769 #****STUDY OF RUBY LASER RADIATION CHARACTERISTICS [ISSLEDovanie Kharakteristik Izlucheniia Rubinovogo Lazera].**

M. P. Lisitsa, N. R. Kulish, A. M. Iaremko, P. M. Koval', and V. I. Geets.

Optika i Spektroskopiia, vol. 21, July 1966, p. 76-81. 10 refs. In Russian.

Theoretical and experimental proof of the dependence of the pumping threshold energy, divergence angle, and output power of a laser on the resonator length. The dependence of the distribution curve for the emitted energy on the angle between the reflecting surfaces of a laser resonator is investigated. The theoretical and experimental results are in fair qualitative agreement.

V.Z.

**A66-39770 #****LIGHT PROPAGATION IN A STRONGLY ABSORBING MEDIUM [O RASPROSTRANENII SVETA V SIL'NOPOGLOSHCHAIUSHCHEI SREDE].**

A. V. Rezvov.

Optika i Spektroskopiia, vol. 21, July 1966, p. 95-98. In Russian.

Consideration of possible use of intensive luminous fluxes for the effective brightening of laser radiation. The normal passage of a photon flux through a plane-parallel layer of a medium is discussed, assuming that the medium contains uniformly spaced absorption centers subject to relaxation processes similar to those in a laser.

V.Z.

**A66-39771 #****POSSIBLE USE OF INDUCED TWO-QUANTA LUMINESCENCE IN THE PRODUCTION OF POWERFUL COHERENT LIGHT EMISSION [O VOZMOZHNOСТИ ISPOL'ZOVANIA INDITSIROVANNOI DVUKHKVANTOVOI LIUMINESENTSII DLIIA SOZDANIA MOSHCNOGO KOGERENTNOGO IZLUCHEENIIA SVETA].**

A. S. Selivanenko.

Optika i Spektroskopiia, vol. 21, July 1966, p. 100, 101. In Russian.

Brief note on the prospects of constructing powerful lasers that employ induced two-quanta luminescence. A second-approximation equation of the disturbance theory is derived for the probability of generation of two-quanta luminescence. An analysis of this equation indicates the theoretical possibility of such lasers.

V.Z.

**A66-39812 #****EXTREME ULTRA-VIOLET SPECTRA FROM LASER-PRODUCED PLASMAS.**

B. C. Fawcett, A. H. Gabriel, F. E. Irons, N. J. Peacock, and P. A. H. Saunders (United Kingdom Atomic Energy Authority, Atomic Energy Research Establishment, Culham Laboratory, Culham, Berks., England).

Physical Society, Proceedings, vol. 88, Aug. 1966, p. 1051-1053.

Plasmas produced by focusing a 400-Mw ruby laser beam onto surfaces of C, Ti, Mn, Fe, Ni, Cu and Zn, and into argon gas, have been observed in the EUV region. Line and continuum radiation have been recorded down to  $25\text{ \AA}$ , including new spectra of Fe XV and Fe XVI and Ni XVII and Ni XVIII. The value of such plasmas for line classification work is demonstrated. (Author)

**A66-39823 #****STUDY OF THE SPECTRAL CHARACTERISTICS OF STIMULATED RADIATION OF A RUBY [ISSLEDOVANIYE SPEKTRAL'NYKH KHA-RAKTERISTIK STIMULIROVANNOGO IZLUCHENIYA RUBINA].**

M. E. Movsesian, Iu. S. Chilingarian, and N. N. Badalian (Erevan-skii Gosudarstvennyi Universitet, Yerevan, Armenian SSR).

Akademiia Nauk Armianskoi SSR, Izvestiia, Fizika, vol. 1, no. 2, 1966, p. 61-65. 9 refs. In Russian.

Investigation of the spectral and time-dependent radiation characteristics of a ruby pulse laser. A Fabry-Pérot etalon is used in fine-structure observations of the forced-radiation line. The most probable intercomponent frequency separation value in the fine structure is found to differ in individual ruby specimens. The time of occurrence of various specific frequencies is estimated by time-scanning of the radiation pulse. V. Z.

**A66-39851 #****CAVITY FOR TUNING A MASER BY MEANS OF ZEEMAN MODULATION.**

V. V. Grigor'iants and Iu. A. Mazurov.

Radiotekhnika i Elektronika, vol. 11, Jan. 1966, p. 152-154.)

Radio Engineering and Electronic Physics, vol. 11, Jan. 1966, p. 126-128. Translation.

[For abstract see issue 09, page 1357, Accession no. A66-20792]

**A66-39930****GOVERNING INFLUENCE OF ATOMIC DEGENERACY ON MODE INTERACTIONS IN A GAS LASER.**

W. M. Doyle and M. B. White (Philco Corp., Aeronutronic Div., Newport Beach, Calif.).

Physical Review Letters, vol. 17, Aug. 29, 1966, p. 467-470. 5 refs.

Results of an experimental study of laser mode coupling which has served to verify and to determine the extent of the validity of some of the predictions of a previous theoretical treatment of the behavior of a generalized gas laser which indicated that the behavior is strongly dependent on the degenerate nature of the atomic energy levels participating in a given laser transition. This study was principally concerned with the interaction of two modes, the frequency separation of which is small compared to the decay constants of the participating atomic levels. In this limit the theoretical expressions simplify sufficiently to allow easy comparison with experiment. F.R. L.

**A66-40012****ANOMALOUS REFLECTIVITY OF SHOCK WAVES.**

Ian N. Court and William R. Mallory (General Electric Co., Defense Electronics Div., Electronics Laboratory, Syracuse, N.Y.).

Nature, vol. 211, Aug. 6, 1966, p. 625. 6 refs.

USAF-supported research.

Experimental study to clarify existing data on the reflection of light from shock waves. It is considered that the best clarifying method is to examine shock waves propagating in shock tubes for reflections other than those of the Fresnel type. An He-Ne gas laser and means for controlling humidity in the shock tube are used. It is found that the periodic appearance of scattering could be directly correlated with fall of pressure below ambient, suggesting that the observed reflections may also have been scattering from water droplets which are condensed in the expansion phase which follows the shock front. The intensity of the observed reflections is found to be consistent with the assumption that scattering was occurring from particles with radii of  $0.1\text{--}5\text{ }\mu$ . M.L.

**A66-40089****A CONTINUUM MECHANICAL MODEL FOR LASER-INDUCED FRACTURE IN TRANSPARENT MEDIA.**

Gary H. Connors and Robert A. Thompson (Rochester, University, Dept. of Mechanical and Aerospace Sciences, Rochester, N.Y.).

Journal of Applied Physics, vol. 37, Aug. 1966, p. 3434-3440. 13 refs.

NSF-supported research.

Theoretical investigations in the area of laser-induced damage in transparent media have been primarily directed toward explaining the mechanism by which sufficient energy can be absorbed to cause the observed fracture. However, the work considered here is based on a theoretical investigation of damage from a macroscopic point of view, with the goal of developing a simple continuum mechanical model for the processes leading up to fracture. In this case, the energy absorbed and nonlinear absorption effects are related to the beam's total energy through an experimentally determined absorption parameter. The problem is formulated in terms of dynamic thermoelasticity theory, the energy absorbed from the laser beam being represented by a volume heat source with a physically reasonable space and time dependence based on diffraction theory and known parameters of the optical system. The nonhomogeneous, thermoelastic field equation is solved for the stress distribution by a Green's function technique. By introducing a tensile stress fracture criterion, conditions under which fracture can be initiated during the irradiation process are obtained. Initial numerical results based on an  $f/30$  lens give a good explanation of the phenomenon of the pulverized region associated with laser damage and indicate that this region has a diameter of about  $0.4\text{ mm}$ , which is in good agreement with experimental findings. (Author)

**A66-40098****EFFECT OF SPECTRAL HOLE-BURNING AND CROSS RELAXATION ON THE GAIN SATURATION OF LASER AMPLIFIERS.**

Amado Y. Cabezas and Richard P. Treat (Hughes Aircraft Co., Aerospace Group, Culver City, Calif.).

Journal of Applied Physics, vol. 37, Aug. 1966, p. 3556-3563. 12 refs.

Contract No. AF 33(615)-1648.

A theory is presented for the effect of cross relaxation (CR) on the saturation with driving-signal intensity of the steady-state gain of a laser amplifier with an inhomogeneously broadened linewidth. The condition of steady-state gain results when the amplifier excitation level  $W$  and the driving-signal intensity are constant for about  $3\tau$  or longer, where  $\tau$  is the fluorescence lifetime of the upper laser level. The driving signal is derived from an oscillator operated in the normal mode and which does not saturate the amplifier inversion density over times short compared with  $\tau$ . We assume that CR, at a rate  $F$ , restores to thermal equilibrium any distortion of the spectral inversion density caused by the driving signal. Formulas are derived for steady-state gain saturation with arbitrary  $F$ . Finally, the theory is applied to experimental results obtained for  $\text{Nd}^{3+}$ :glass broadband and narrow-band amplification; an approximate lower bound of  $4 \times 10^5\text{ sec}^{-1}$  is determined for  $F$ . (Author)

**A66-40100****ANALYSIS OF A ROOM-TEMPERATURE CW RUBY LASER OF 10-MM RESONATOR LENGTH - THE RUBY LASER AS A THERMAL LENS.**



Dieter Roess (Siemens und Halske AG, Zentrallaboratorien, Munich, West Germany).

Journal of Applied Physics, vol. 37, Aug. 1966, p. 3587-3594. 31 refs.

Research supported by the Bundesministerium für wissenschaftliche Forschung.

A nominally plane-parallel ruby laser of 10-mm length was investigated in continuous operation in an ellipsoidal pumping system under water cooling. The laser emits pure transverse modes of low order. The zero-order mode can be described by Gaussian distributions; it corresponds approximately to the mode of a confocal resonator of 9-cm radius of curvature. The resonator curvature is induced by a thermal curvature of the ruby end faces and by a bulk thermal lens effect. The axial-mode frequencies and the emission-center frequency shift to smaller values with increasing pump power as a consequence of the increasing ruby temperature in CW operation. The relaxation pulses of single axial modes do not overlap in this short laser, and the interaction of different axial modes can be observed in the emission of one mode. Consequences of the observed thermal curvature for the transverse mode selection of CW and pulsed crystal lasers are discussed.

(Author)

#### A66-40102

SPONTANEOUS AND STIMULATED EMISSION FROM GaAs DIODES WITH THREE-LAYER STRUCTURES.

M. Pilkuhn and H. Rupprecht (International Business Machines Corp., Thomas J. Watson Research Center, Yorktown Heights, N.Y.).

Journal of Applied Physics, vol. 37, Aug. 1966, p. 3621-3628. 39 refs.

The electrical and optical properties of GaAs diodes with three-layer structures are described. The center layer was either n-type ( $n^+-n-p^+$  diodes), semiinsulating ( $n^+-i-p^+$  diodes) or p-type ( $n^+-p-p^+$  diodes). The spontaneous emission lines from  $n^+-n-p^+$  diodes were studied in detail. For a low doping level of the n layer they can be interpreted by assuming hole recombination on the n side of the  $p^+-n$  junction. Lasing occurred in a 1.5-ev line and in second-order transverse modes. Small vertical beamspreads were observed. Optical gain factor and laser losses are discussed. Stimulated emission was not obtained when the n layer was very thick.  $n^+-i-p^+$  diodes had a Cr-doped middle region and showed a negative resistance at 300°K. Lasing occurred in the 1.48-ev line. The  $n^+-p-p^+$  diodes showed emission lines attributed to tunneling. Lasing occurred in the 1.48-ev line. The temperature dependence of the threshold current density is discussed.

(Author)

#### A66-40103

OPTICAL PROPERTIES OF CRYPTOCYANINE.

Thomas F. Deutsch and Marvin J. Weber (Raytheon Co., Research Div., Waltham, Mass.).

Journal of Applied Physics, vol. 37, Aug. 1966, p. 3629.

Extension of optical measurements of cryptocyanine to the near-IR and near-UV regions. Fluorescence, which as previously suggested should occur in the IR, was observed and its spectrum is reported. An attempt was also made to measure the fluorescence decay time. The transmission of a  $10^{-5}$  M solution of cryptocyanine in methanol is plotted as well as its transmission at three wavelengths as a function of concentration. Also shown is a plot of the fluorescence and excitation spectra of two different cryptocyanine solutions.

M. F.

#### A66-40107

A PULSED, COAXIAL TRANSMISSION LINE GAS LASER.

M. Geller, D. E. Altman, and T. A. DeTemple (U.S. Navy, Electronics Laboratory, San Diego, Calif.).

Journal of Applied Physics, vol. 37, Aug. 1966, p. 3639, 3640. 5 refs.

Description of a pulsed, coaxial transmission line gas laser and of its performance with nitrogen. At a pressure of 6 torr of nitrogen, the superradiance pulse at 3371 Å was 10-nsec wide with a peak power of 20 kw. Stimulated emission was not observed at pressures below 1 torr.

M. F.

#### A66-40110

MEASUREMENTS OF ARGON SINGLE-FREQUENCY LASER POWER AND THE 6328-Å NEON ISOTOPE SHIFT USING AN INTERFEROMETER LASER.

Peter Zory (Sperry Rand Corp., Sperry Gyroscope Co., Great Neck, N.Y.).

Journal of Applied Physics, vol. 37, Aug. 1966, p. 3643, 3644.

Brief summary of the use of an intracavity interferometer laser for obtaining both large single-frequency laser power and information about the atomic characteristics of laser-gain media. Experiments on obtaining single-frequency laser powers of 130 mw and 120 mw from the 4880- and 5145-Å transitions of ionized argon are outlined, and measurements were made of the frequency difference between the 6328-Å transition of  $^{20}\text{Ne}$  and  $^{22}\text{Ne}$ . The experimental setup used for argon power measurements was a discharge tube of 2-mm-bore quartz with a 50-cm active discharge length; the laser powers were obtained with an argon filling pressure of 0.5 torr and a discharge current of 15 amp. The same basic configuration was used for the neon experiment except the prism was removed and the tube had a 5-mm bore and a 120-cm discharge length. The laser power outputs are graphed, and a theoretical analysis is being prepared for the shape of the readily observable "Lamb dip."

S. Z.

#### A66-40175

PERFORMANCE OF ROOM TEMPERATURE GaAs LASERS AT HIGH PULSE REPETITION RATES (50 KC/S).

G. C. Dousmanis and H. E. Gross (Radio Corporation of America, RCA Laboratories, Princeton, N.J.).

IEEE, Proceedings, vol. 54, July 1966, p. 998, 999.

Research sponsored by the Radio Corporation of America; Contract No. DA-28-043-AMC-01501(E).

Study of the performance of GaAs laser diodes at room temperature with 100 nsec pulses at pulse repetition rates up to 50 kc. It is shown that pulse repetition rates of up to 50 kc can be achieved by firing a number of silicon-controlled rectifiers in succession. A comparison is made of the output power vs current for a GaAs laser at 1, 30, and 50 kc. It is found that the rise in threshold and the drop in power output with increasing pulse repetition rate can be decreased by increasing the doping of the epitaxial crystal from which the laser is made. A study is made of the laser emission spectrum at 50 kc, with the current about 50% above threshold. The pattern is found to be similar to that obtained at very low repetition rates, although it differs in the spacing between modes.

A. B. K.

#### A66-40184

CIRCUIT THEORY CONSIDERATION OF MAXIMIZATION OF LASER OUTPUT.

N. Kumagai and M. Matsuda (Osaka University, Faculty of Engineering, Osaka, Japan).

Electronics and Communications in Japan, vol. 48, July 1965, p. 36-42, 9 refs. Translation.

The reflecting mirrors in laser oscillators are treated as both reflecting elements and transducers for coupling the power from the oscillator to external space (the load). The relation between the power output and the reflection coefficient is derived. A theoretical explanation for some of the experimental results on the dependence of the power output on the reflection coefficient is given. In order to carry out the analysis in terms of electrical circuit theory, equivalent circuits for laser oscillators are introduced, and the operation of the laser is also described in circuit terminology. The analysis shows that it is possible to treat the complex phenomena of the laser oscillation mechanism, including the nonlinear saturation effect of the active medium, as an electrical circuit problem. The engineering design of quantum electronic systems may become easier by such techniques.

(Author)

**A66-40194 #**

HEATING OF A TWO-LAYER PLATE IN WELDING WITH A LASER LIGHT FLUX [NAGREV DVIKHSLONINOI PLASTINY PRI SVARKE SVETOVYM POTOKOM LAZERA].

N. N. Rykalin, A. A. Uglov, and N. I. Makarov (Akademiia Nauk SSSR, Institut Metallurgii, Moscow, USSR).

*Akademiia Nauk SSSR, Doklady*, vol. 169, July 21, 1966, p. 565-568. In Russian.

Determination of the temperature distribution in a two-layer plate during welding by a laser light flux. The system of equations and the boundary conditions for this problem are subjected to an integral transformation with respect to a radial variable. The solution to the problem is then found by the method of separation of variables or with the aid of a Laplace transform with respect to a time variable. Since this solution is effective only for small values of time, it is recommended that an approximate solution obtained by a Hankel transform with respect to the radial variable and a Laplace transform with respect to the time variable be used for large values of time.

A. B. K.

**A66-40274 #**

LASER WELDING STUDIES.

C. M. Adams, Jr. (Massachusetts Institute of Technology, Cambridge, Mass.).

IN: JOINING OF MATERIALS FOR AEROSPACE SYSTEMS; SOCIETY OF AEROSPACE MATERIAL AND PROCESS ENGINEERS, NATIONAL SYMPOSIUM, 9TH, DAYTON, OHIO, NOVEMBER 14-16, 1965, PAPERS. [A66-40255 22-15]

North Hollywood, Calif., Western Periodicals Co., 1965. 39 p.

Discussion of the solid state laser, a device which produces a light beam of sufficient intensity that when focused through an appropriate optical system it can function as a local heat source for fusion welding. The principal advantages of the laser for welding are: (1) the beam has a high intensity; (2) its energy can be delivered through any transparent medium including air, controlled atmosphere, or vacuum; (3) there is no necessity for mechanical contact with the workpiece; and (4) the beam can be manipulated with precision using simple optical systems. The laser lends itself particularly to spot welding relatively thin materials, especially those having high thermal conductivity and low vapor pressures.

M. M.

**A66-40314 #**

COMPARATIVE STUDY OF RECOMBINATION RADIATION FROM GaAs p-n JUNCTIONS WITH AND WITHOUT A FABRY-PEROT RESONATOR [SRAVNITEL'NOE ISSLEDOVANIE REKOMBINATSIONNOGO IZLUCHENIIA GaAs p-n-PEREKHODOV S REZONATOROM FABRY-PERO I BEZ REZONATORA].

T. N. Danilova, L. M. Kogan, S. S. Meskin, D. N. Nasledov, and B. V. Tsarenkov (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR).

*Fizika Tverdogo Tela*, vol. 8, Aug. 1966, p. 2462-2465. In Russian.

Experimental determination of the energy of the radiation-band maximum ( $h\nu_M$ ) and the ground-band halfwidth ( $\delta$ ) in diodes with p-n junctions produced by Zn diffusion into Te-doped n-type GaAs. The dependence of these parameters on current density is compared for p-n junctions with and without a Fabry-Pérot resonator.

V. Z.

**A66-40318 #**

EXCITATION OF ULTRASONIC OSCILLATIONS IN CRYSTALS UNDER THE EFFECT OF RUBY-LASER RADIATION [VOZBUZHDENIE UL'TRAZVUKOVYKH KOLEBANIÍ KRISTALLOV POD DEISTVIE IZLUCHENIIA OKG NA RUBINE].

A. N. Bondarenko, G. V. Krivoshechekov, S. I. Marennikov, E. V. Pestriakov, and G. A. Savvinykh (Akademiia Nauk SSSR, Sibirskoe Otdelenie, Institut Fiziki Poluprovodnikov, Novosibirsk, USSR).

*Fizika Tverdogo Tela*, vol. 8, Aug. 1966, p. 2490-2492. In Russian.

Experimental investigation of the laser-induced effect of pulsed pressure on the surface of a KDP crystal and of the thermal bulk effect (associated by absorption) on the excitation of ultrasonic oscillations in the crystal. It is shown that the spectrum of the

oscillations consists of a range of frequencies which, for the type of crystal studied, are harmonics of the principal frequency ( $f = 75$  kc). V. P.

**A66-40319 #**

GENERATION OF COHERENT RADIATION IN AN ELECTRON-HOLE INDIUM-ANTIMONIDE PLASMA [GENERATSIIA KOGERENTNOGO IZLUCHENIIA V ELEKTRONNO-DYROCHNOI PLAZME ANTIMONIDA INDIIA].

A. P. Shotov, S. P. Grishechkina, and R. A. Muminov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*Fizika Tverdogo Tela*, vol. 8, Aug. 1966, p. 2496, 2497. In Russian.

Discussion of a laser employing a p-InSb crystal measuring  $0.33 \times 0.33 \times 0.25$  mm with reflecting surfaces in the [100] plane. Designed to operate at 4.2°K, the device is shown to be superior to existing InSb laser with regard to generation at relatively weak magnetic fields ( $\sim 4$  koe) and pulse durations of up to 10  $\mu$ sec for near single-mode operation at low threshold currents. The emission spectrum of the device is given and discussed.

V. P.

**A66-40336**

PUMPING NEW LIFE INTO RUBY LASERS.

Dieter Roess and Guenter Zeidler (Siemens und Halske AG, Zentrallaboratorien, Munich, West Germany).

*Electronics*, vol. 39, Sept. 5, 1966, p. 115-118.

Discussion of a new laser pumping system and of a low-cost mercury flashtube which has longer life and higher repetition rates than existing equipment. The new tube is said to have from 100 to 100,000 times the lifetime of a xenon tube at one-tenth the cost per tube. It is claimed that the laser is particularly suited to micro-machining processes involving melting, drilling, cutting, and trimming.

B. B.

**A66-40421**

TEMPERATURE MEASUREMENTS OF A LASER SPARK FROM SOFT-X-RAY EMISSION.

A. J. Alcock, S. A. Ramsden (National Research Council, Div. of Pure Physics, Ottawa, Canada), and P. P. Pashinin (Academy of Sciences, Physics Institute, Moscow, USSR).

*Physical Review Letters*, vol. 17, Sept. 5, 1966, p. 528-530. 9 refs.

Study of temperature measurements of laser sparks from the relative intensity of the X-ray flux transmitted through beryllium foils of different thickness. The X-ray emission was detected with two plastic scintillators, each of which was optically coupled to a photomultiplier. The fast response of such a detection system is claimed to have permitted a much better time resolution than can be obtained using a Geiger counter.

B. B.

**A66-40496**

POINTING IN SPACE.

Neal G. Lozins (Bell Aerospace Corp., Bell Aerosystems Co., Buffalo, N. Y.).

*Space/Aeronautics*, vol. 46, Aug. 1966, p. 76-83.

Discussion of the deep-space laser technique as being dependent on the use of very narrow beam-widths, sufficient transmission power and modulation capability. The application of this technology must cope with a long list of error sources; it depends on achieving precision pointing through a sophisticated system design. The nature of the system is perhaps as good an indication as any that the many problems of pointing from deep space are not insurmountable. The long acquisition times and the use of sequentially stepped receiver fields of view, combined with a cooperative beacon, ease the requirements considerably. For the near term, pointing capabilities do not appear to be limiting factor in deep-space exploration. In fact, the transition from open to closed loop pointing may be more limiting than pointing accuracy itself.

S. Z.

**A66-40586**

EFFECT OF A LONGITUDINAL MAGNETIC FIELD ON THE OPERATION OF A HELIUM-NEON LASER AT  $\lambda = 0.6328 \mu$ .  
D. K. Terekhin and S. A. Fridrikhov (Leningradskii Politekhnikheskii Institut, Leningrad, USSR).  
(Zhurnal Tekhnicheskoi Fiziki, vol. 36, Feb. 1966, p. 394-397.)  
Soviet Physics - Technical Physics, vol. 11, Aug. 1966, p. 288-290, 8 refs. Translation.  
[For abstract see issue 12, page 1890, Accession no. A66-24224]

**A66-40658**

SATELLITE COMMUNICATIONS BY TRAVELING-WAVE MASER.  
Shin'ichiro Yoshida, Hiroo Yonemitsu, and Sadao Takahashi (Tokyo Shibaura Electric Co., Ltd., Toshiba Central Research Laboratory, Kawasaki, Japan).  
Toshiba Review, Apr.-June 1966, p. 39-44. 10 refs.

Brief description of a traveling-wave maser for satellite communications. The maser setup consists of three units: the maser assembly, a dc power supply, and a temperature control unit. The characteristics necessary for this maser to operate as a preamplifier in the ground station system of satellite communications are described. The results obtained proved the maser's excellence in communication tests using the Telstar and Relay satellites. M.M.

**A66-40790**

MULTIMODE PROPERTIES OF VARIOUS SEMICONDUCTOR LASER TYPES. II [MULTIMODE-EIGENSCHAFTEN VERSCHIEDENER HALBLEITERLASERMODELLE. II].  
Hartmut Haug (Stuttgart, Technische Hochschule, Institut für theoretische und angewandte Physik, Stuttgart, West Germany).  
Zeitschrift für Physik, vol. 195, no. 1, 1966, p. 74-97. 9 refs. In German.

Investigation of the effect of electron thermalization due to electron interband scattering on semiconductor laser behavior. It is shown that no hole-burning occurs during optical interband transitions obeying the k-selection rule, when the scattering relaxation time is substantially less than the radiative lifetime. A model of optical transitions between an impurity level and a band is constructed, taking into account the diffusion processes. Band homogenization in multimode lasers is considered. V.Z.

**A66-40824**

STEADY-STATE OSCILLATIONS IN LASERS.  
A. I. Alekseev and Iu. A. Tarasov (Moskovskii Inzhenerno-Fizicheskii Institut, Moscow, USSR).  
(Fizika Tverdogo Tela, vol. 8, Mar. 1966, p. 696-704.)  
Soviet Physics - Solid State, vol. 8, Sept. 1966, p. 558-564. 20 refs. Translation.  
[For abstract see issue 14, page 2306, Accession no. A66-27065]

**A66-40866**

DYNAMIC LASER WAVELENGTH SELECTION.  
M. A. Habegger, T. J. Harris (International Business Machines Corp., Systems Development Div., Poughkeepsie, N.Y.), and E. Max (International Business Machines Corp., Systems Development Div., Böblingen, West Germany).  
IBM Journal of Research and Development, vol. 10, July 1966, p. 346-350. 14 refs.

This paper describes the dynamic selection of the emission wavelengths of a laser by insertion of a dispersive tunable electro-optic Q-spoiler within the laser cavity. Five different oscillation wavelengths of an argon ion laser have been individually selected by varying the voltage on the KD\*P electrooptic crystals in the Q-spoiler.

(Author)

**A66-40892**

LASER LINES IN ATOMIC AND MOLECULAR HYDROGEN.  
K. Bockasten, T. Lundholm, and O. Andrade (Uppsala, Royal

University, Dept. of Physics, Uppsala, Sweden).  
Optical Society of America, Journal, vol. 56, Sept. 1966, p. 1260, 1261. 8 refs.

Research supported by the Swedish Natural Science Research Council.

Description of an experiment with a pulsed discharge in helium where strong oscillations at the wavelength 18,751 Å were obtained. Hydrogen was present in the tube as an impurity and the new laser line was interpreted as being the first member of the Paschen series. To the authors' knowledge, this is the first reported laser line in atomic hydrogen. In the subsequent investigation of the dependence of this line on the hydrogen pressure, oscillations at seven new wavelengths were obtained in a pulsed discharge in pure hydrogen at a pressure of a few torr. These lines could be classified as transitions in the molecular spectrum of hydrogen. The wavelengths of these lines have been accurately determined and the gain of the various lines has been studied. The measurements of the authors confirm those reported by Bazhulin, Knyazev, and Petrasch. M.F.

**A66-40917 #**

ENERGY BALANCE OF LASER RADIATION NOISE [BALANS ENERGIY RADIATSIONNOGO SHUMA V OPTICHESKIKH KVANTOVYKH GENERATORAKH].  
B. I. Stepanov and A. S. Rubanov (Akademiia Nauk Belorusskoi SSR, Institut Fiziki, Minsk, Belorussian SSR).  
Akademiia Nauk SSSR, Doklady, vol. 169, Aug. 1, 1966, p. 819-822. In Russian.

Study of the effect of radiation noise on the optical properties of lasers. An analysis is made of the energy balance of the radiation noise for the purpose of relating the noise-radiation density to the resonator characteristics. A general scheme for calculating the energy characteristics of solid-state lasers, taking into account the effect of radiation noise, is proposed. A.B.K.

**A66-40946 #**

SPECTROSCOPIC INVESTIGATION OF THE LASER SPARK. I - SPARK IN HELIUM [SPEKTROSKOPICHESKIE ISSLEDOVANIYA LAZERNOI ISKRY. I - ISKRA V GELII].  
T. P. Evtushenko, A. N. Zaidel', G. V. Ostrovskaya, and T. Ia. Chelidze (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR).  
Zhurnal Tekhnicheskoi Fiziki, vol. 36, Aug. 1966, p. 1506-1513. 5 refs. In Russian.

Spectroscopic investigation of the discharge produced in pure helium and helium with hydrogen additions by the focused beam of a laser with Q-factor modulation. The spectra of the laser "spark" are obtained at pressures from 1 to 10 atm. Time bases of the individual spectral lines and regions of the spectrum are obtained with a high-speed streak camera. The existence of a second maximum of radiation brightness is observed for some of the spectral lines. The electron concentration at various stages of spark development is determined from the width of the spectral lines. V.P.

**A66-41030**

EFFECTS OF ATMOSPHERIC TURBULENCE ON THE TRANSMISSION OF A LASER BEAM AT 6328 Å. I - DISTRIBUTION OF INTENSITY.

D. H. Höhn (Tübingen, Universität, Astronomisches Institut, Tübingen, West Germany).  
Applied Optics, vol. 5, Sept. 1966, p. 1427-1431. 20 refs.  
Research sponsored by the Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung.

The intensity variations of a laser beam by atmospheric turbulence were investigated using an He-Ne gas laser at 6328 Å with a beam diameter of about 3.5 mm and optical path lengths of 4.5 km and 14.5 km. The log-normal approximation of the intensity distribution was found to be of limited accuracy especially at high scintillation. The variation of the scintillation with the diameter of the entrance aperture of the photometer (5 mm to 80 mm) was small at the above-mentioned conditions. (Author)

**A66-41031**

EFFECTS OF ATMOSPHERIC TURBULENCE ON THE TRANSMISSION OF A LASER BEAM AT 6328 Å. II - FREQUENCY SPECTRA.

D. H. Höhn (Tübingen, Universität, Astronomisches Institut, Tübingen, West Germany).

Applied Optics, vol. 5, Sept. 1966, p. 1433-1436. 5 refs.

Research sponsored by the Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung.

The frequency spectra of light intensity fluctuations of a laser beam by atmospheric turbulence were investigated using an He-Ne laser at 6328 Å with a beam diameter of about 3.5 mm and optical path length of  $L = 4.5$  km and 14.5 km. The normalized spectra  $U(f)$  were not systematically affected by different receiving aperture diameters  $5 \text{ mm} \leq D \leq 80 \text{ mm}$ , probably because of the small diameter of the output aperture of the source. The theoretical relation  $f_c \propto L^{-1/2}$ , where  $f_c$  is a characteristic frequency of  $U(f)$ , does not appear to hold empirically. (Author)

**A66-41032**

A SELF-CALIBRATING TECHNIQUE MEASURING LASER BEAM INTENSITY DISTRIBUTIONS.

I. M. Winer (Korad Corp., Santa Monica, Calif.).

Applied Optics, vol. 5, Sept. 1966, p. 1437-1439.

A technique is described which yields quantitative photographic determinations of laser beam intensity distributions. Each photograph is self-calibrated, eliminating the effect of variation from one film sample to another, by a technique which is indifferent to the nonlinear response of the emulsion. Study of the beam divergence characteristics of a saturable dye, Q-switched ruby oscillator-amplifier system is presented. (Author)

**A66-41033**

THE OPERATION OF A NEODYMIUM GLASS LASER USING A SATURABLE LIQUID Q-SWITCH.

C. H. Skeen (TRW, Inc., TRW Systems Group, Redondo Beach, Calif.) and C. M. York (California, University, Dept. of Physics, Los Angeles, Calif.).

Applied Optics, vol. 5, Sept. 1966, p. 1463, 1464.

Study of the operation of a neodymium-doped glass laser in the passively Q-switched mode using bleachable liquid. It is found that high peak power pulses are obtainable from neodymium glass lasers using saturable dye Q-switches, and that a system using an oscillator with the saturable dye Q-switch can be operated to obtain single giant pulses. B.B.

**A66-41034**

STABILITY OF AN IDEALIZED TWO LEVEL LASER.

B. D. Sukheeja and M. L. Narchal (Regional Engineering College; Kurukshetra, University, Physics Dept., Kurukshetra, India).

Applied Optics, vol. 5, Sept. 1966, p. 1464, 1465.

Rigorous investigation of transients and stability of a previously reported idealized two-level laser system. The solutions of rate equations are obtained up to second-order approximation. The stability of the laser is established, and the approach to the steady state is found to be nonoscillatory and characterized by two fundamental relaxation times (which depend on the coefficients of spontaneous emission, stimulated emission, attenuation constant, and the pump rate) and their harmonic sums, which arise as a consequence of the nonlinearity of the rate equations. B.B.

**A66-41088**

DISCRIMINATION OF AXIAL OSCILLATION MODES IN A LASER WITH EXTERNAL MIRRORS.

V. I. Malyshev and A. S. Markin (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 50, Feb. 1966, p. 339-342.)

Soviet Physics - JETP, vol. 23, Aug. 1966, p. 225-227. 8 refs. Translation.

[For abstract see issue 12, page 1891, Accession no. A66-24881]

**A66-41091**

PULSED STIMULATED EMISSION IN A HYDROGEN-ATOM BEAM LASER.

G. M. Strakhovskii and A. V. Uspenskii (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 50, Feb. 1966, p. 372-375.)

Soviet Physics - JETP, vol. 23, Aug. 1966, p. 247-249. Translation.

[For abstract see issue 12, page 1891, Accession no. A66-24884]

**A66-41092**

DEPENDENCE OF THE RADIATION INTENSITY OF A GAS LASER ON THE MAGNETIC FIELD.

M. I. D'iaconov and V. I. Perel' (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR).

(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 50, Feb. 1966, p. 448-456.)

Soviet Physics - JETP, vol. 23, Aug. 1966, p. 298-303. 9 refs. Translation.

[For abstract see issue 12, page 1891, Accession no. A66-24885]

**A66-41094**

THE MECHANISM OF THE OPTICAL BREAKDOWN IN A GAS.

V. A. Barynin and R. V. Khokhlov (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR).

(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 50, Feb. 1966, p. 472, 473.)

Soviet Physics - JETP, vol. 23, Aug. 1966, p. 314, 315. 5 refs. Translation.

[For abstract see issue 12, page 1891, Accession no. A66-24887]

**A66-41095**

THEORY OF GENERATION OF OPTICAL HARMONICS IN CONVERGING BEAMS.

S. A. Akhmanov, A. P. Sukhorukov, and R. V. Khokhlov (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR).

(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 50, Feb. 1966, p. 474-486.)

Soviet Physics - JETP, vol. 23, Aug. 1966, p. 316-323. 11 refs. Translation.

[For abstract see issue 12, page 1891, Accession no. A66-24888]

**A66-41153**

FLUORESCENCE QUANTUM EFFICIENCIES OF OCTA-COORDINATED EUROPIUM HOMOGENEOUS AND MIXED CHELATES IN ORGANIC SOLVENTS.

N. Filipescu, G. W. Mushrush (George Washington University, Dept. of Chemistry, Washington, D.C.), C. R. Hurt, and N. McAvoy (NASA, Goddard Space Flight Center, Greenbelt, Md.).  
Nature, vol. 211, Aug. 27, 1966, p. 960, 961. 17 refs. NASA-supported research.

Determination of the quantum efficiency of several octa-coordinated europium homogeneous and mixed chelates in a number of solvents at 25°C. The corrected fluorescence spectra of the chelate solutions were plotted against wavenumber, and the area under the true fluorescence spectrum was calculated and compared with that obtained with freshly prepared solutions of rhodamine B in ethyl alcohol and eosin, in both ethyl alcohol and 10 N sodium hydroxide. The results found for dimethylformamide and acetonitrile for  $10^{-3}$  M chelate solutions are tabulated. The results were found to be reproducible to within 1%. The removal of oxygen from the solutions did not significantly change the quantum efficiencies. M.M.

**A66-41156 #**

OPTICAL BREAKDOWN IN METAL VAPOURS.

J. E. Rizzo and R. C. Klewe (Central Electricity Generating Board, Marchwood Engineering Laboratories, Southampton, England).

British Journal of Applied Physics, vol. 17, Sept. 1966, p. 1137-1141. 11 refs.

Mercury, cesium and rubidium vapors have been ionized in the intense radiation flux produced by a Q-switched ruby laser. The technique used is applicable to metals which can be handled in vapor tubes. The characteristic threshold for breakdown of the vapors appears at a density of  $1.3 \times 10^{20}$  atoms/cm<sup>3</sup> for mercury,  $1.2 \times 10^{16}$  atoms/cm<sup>3</sup> for cesium, and  $5 \times 10^{16}$  atoms/cm<sup>3</sup> for rubidium, for a radiation flux of  $5 \times 10^9$  watts/cm<sup>2</sup>. These results are compared with measurements by Meyerand and Haught in 1963 which give thresholds at densities of  $4.8 \times 10^{20}$  atoms/cm<sup>3</sup> for argon and  $3.4 \times 10^{21}$  atoms/cm<sup>3</sup> for helium at the same flux. The very low thresholds for breakdown in cesium and rubidium appear to be inconsistent with all theories so far offered to explain the phenomenon. (Author)

**A66-41160 #**

INTERNAL SELF-DAMAGE IN A 25 MW RUBY LASER OSCILLATOR. D. J. Bradley, A. W. McCullough, and P. D. Smith (London, University, Royal Holloway College, Dept. of Physics, London, England).

*British Journal of Applied Physics*, vol. 17, Sept. 1966, p. 1221, 1222.

Extensive internal self-damage in a high quality ruby laser oscillator rod at a moderate output power density is reported. The recorded giant pulse envelope was quite distinctive both in its exceedingly rapid rise time ( $< 2$  nsec) and in the depth of modulation. The damage consisted of many small bubbles, approximately 200  $\mu$  in diameter, uniformly distributed throughout the active region of the oscillator rod. (Author)

**A66-41247 #**

A NEW EXCITATION UNIT FOR SOLID STATE CONTINUOUS WAVE LASERS.

J. W. Stearn and D. J. Colliver (Ministry of Aviation, Royal Radar Establishment, Great Malvern, Worcs., England).

*Journal of Scientific Instruments*, vol. 43, Sept. 1966, p. 644-646.

This article gives details of a new approach to the continuous pumping of solid state lasers. The device described is a single compact unit comprising a new form of discharge lamp, with integral mounts for the crystal and an enclosure which provides the cooling circuits for both the lamp and crystal. The systems performance is as good as that of a linear lamp with exfolial ellipsoid, which is by far the best to date and it is more versatile and easy to use and does not rely on a precision optical surface for its efficiency. (Author)

**A66-41266**

NONRELATIVISTIC QUANTUM THEORY OF AN ELECTRON IN AN ARBITRARILY INTENSE LASER FIELD.

H. H. Nickle (Robert College, Istanbul, Turkey).

*Journal of Mathematical Physics*, vol. 7, Aug. 1966, p. 1497-1506, 16 refs.

Research supported by the International Business Machines Corp.

An essentially exact treatment of the time-dependent Schrödinger equation for a Bloch electron (or a free electron) in the presence of an arbitrarily intense laser field is described. Expressions for the wave function, current density, and energy of the electron state are presented in closed form for the case when the effective mass approximation is valid. The limitations of an "almost exact" solution of very simple form are investigated, the corrections to the almost exact solution being determined by the WKB approximation method. The exact solution for the wavefunction turns out to be quite different from that given by perturbation theory. However, the changes in the values of the current density and energy due to the presence of the laser field turn out to be, within the limitations imposed by the nonrelativistic nature of the Schrödinger theory, linear and quadratic in the field amplitude, and therefore agree with the results of perturbation theory. (Author)

**A66-41274**

THEORY OF STEADY MULTIMODE OSCILLATION OF A SOLID-STATE LASER.

L. Ronchi (Consiglio Nazionale delle Ricerche, Centro Microonde, Florence, Italy).  
*Nuovo Cimento*, vol. 44B, Aug. 11, 1966, p. 372-386. 9 refs.  
Contract No. AF 61(052)-871.

Extension of the Tang, Statz, and deMars theory of multimode oscillation of a solid-state laser under steady-state conditions to a case of cavities with inefficient end mirrors or losses dependent on frequency. Losses at end mirrors may be substantial, as in many Q-switch cavities, for example, where only one mirror has a high reflection factor. Any longitudinal mode should be described by two plane waves with amplitudes increasing exponentially in the direction of propagation, so that the net gain per transit of each wave compensates for end-mirror losses. The assumption that cavity losses are the same for all longitudinal modes is valid when the resonator is completely filled with active material but not in other cases, such as resonators designed for mode-selection purposes. W.A.E.

**A66-41291 #**

CORRELATION BETWEEN LASER PERFORMANCE AND CRYSTAL HOMOGENEITIES OF RUBY LASER RODS.

Katsuhiko Nishida (Nippon Electric Co., Ltd., Central Research Laboratories, Kawasaki, Japan).

*Japanese Journal of Applied Physics*, vol. 5, Aug. 1966, p. 727.

Study of the relationship between crystal defects of a ruby laser rod (or crystal-growth conditions) and laser performance. The coherence function of the laser light and output energy were measured, and crystal homogeneity of the ruby rods was measured. A Mach-type interferometer was used to investigate the relationship between coherence function and interference fringe count, and 6328-Å gas laser light was projected along the rod axis to observe the relationship between output energy and the degree of light scattering. "Plane-scattering" parallel to the {1210} plane, which appears to be located at grain boundaries, and "bubble-scattering," with a dimension less than 10  $\mu$ , were the dominant influences on output energy. The appearance of the scatterings was affected by the temperature gradient during crystal growth. W.A.E.

**A66-41294 #**

EFFECT OF PLASMA FLUCTUATIONS ON GAS LASER NOISE.

Uichi Kubo, Kazuo Kawabe, and Yoshio Inuishi (Osaka University, Faculty of Engineering, Osaka, Japan).

*Japanese Journal of Applied Physics*, vol. 5, Aug. 1966, p. 731, 5 refs.

Measurement of the noise in an He-Ne gas laser due to low-frequency oscillations of the plasma. The laser was operated at 6328 Å and 1.153  $\mu$  by a dc source. Graphs of the relationship between the laser noise spectrum and the fluctuation spectrum of the plasma and modulation amplitude of the laser light output vs frequency are included. In operation on 6328 Å, laser modulation decreased as frequency increased above 50 kc, but the decrease was not remarkable above 250 kc. In operation on 1.153  $\mu$ , laser modulation decreased with increasing frequency from several kc to 50 kc. The effect of the lifetime of the He metastable atom is considered to be the origin of the critical frequency. W.A.E.

**A66-41364**

INVESTIGATION OF ELECTRONIC RECOMBINATION IN HELIUM AND ARGON AFTERGLOW PLASMAS BY MEANS OF LASER INTERFEROMETRIC MEASUREMENTS.

M. A. Gusinow, J. B. Gerardo, and J. T. Verdeyen (Illinois, University, Dept. of Electrical Engineering, Gaseous Electronics Laboratory, Urbana, Ill.).

*Physical Review, 2nd Series*, vol. 149, Sept. 9, 1966, p. 91-96, 14 refs.

Army-supported research.

Two helium-neon laser interferometers were used to obtain the electron and neutral-atom densities in an afterglow plasma. The interferometric technique utilized allows one to obtain both the spatial and temporal dependence of the electron decay. The two gases studied were helium and argon at 2 to 8 and 0.3 to 0.8 torr, respectively. The electron density was in the range of  $2 \times$

$10^{13} < N_e < 10^{15} \text{ cm}^{-3}$  and the electron temperature in the range  $1000 < T_e < 7000^\circ\text{K}$ . The electron temperature was measured by comparing the relative atomic line intensities and by inference from the recombination coefficient. The electronic recombination in helium, argon, and helium-argon mixtures was found to be consistent with the predictions of Bates, Kingston, and McWhirter for collisional-radiative recombination. The electron temperature inferred from the measured recombination coefficient indicates a pronounced electron temperature gradient across the tube which is believed to be due to electron heating effects in the afterglow.

(Author)

**A66-41369****PHONON-TERMINATED OPTICAL MASERS.**

L. F. Johnson, H. J. Guggenheim, and R. A. Thomas (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).  
Physical Review, 2nd Series, vol. 149, Sept. 9, 1966, p. 179-185. 13 refs.

The characteristics of phonon-terminated coherent oscillation associated with  $\text{Ni}^{2+}$ ,  $\text{Co}^{2+}$ , and  $\text{V}^{2+}$  ions in rutile and perovskite fluorides are described. Continuous tunability over portions of the vibronic continuum of  $\text{Ni}^{2+}$  in  $\text{MgF}_2$  has been demonstrated. The system has been thermally tuned in discontinuous segments over a total wavelength span from 1.62 to 1.80  $\mu$ , the longest continuous segment being 250  $\text{\AA}$  ( $82 \text{ cm}^{-1}$ ). Alternatively, a frequency-selective element (prism) has been used to vary the oscillation frequency (at a fixed temperature of  $85^\circ\text{K}$ ) in discontinuous segments between 1.62 and 1.84  $\mu$ . The discontinuities are a consequence of structure present in the vibronic continuum of  $\text{Ni}^{2+}$  in  $\text{MgF}_2$ . Continuous-wave oscillation has been obtained from  $\text{Ni}^{2+}$  ions in  $\text{MgF}_2$  and  $\text{MnF}_2$ , requiring, respectively, less than 65 and 240 watts of power into a tungsten lamp. Both systems display continuous spiking, and the spectral distributions of maser emission may be very complex.

(Author)

**A66-41373****QUANTUM THEORY OF LASER RADIATION. I - MANY-ATOM EFFECTS.**

J. A. Fleck, Jr. (California, University, Lawrence Radiation Laboratory, Livermore, Calif.).  
Physical Review, 2nd Series, vol. 149, Sept. 9, 1966, p. 309-321. 23 refs.

AEC-sponsored research.

The interaction is considered between  $N$  stationary two-level atoms and a radiation field described by a single cavity mode. The state vector for the complete system of atoms plus radiation is expressed as a linear superposition of states constructed from a product of photon states in the  $n$  representation and products of Pauli spin eigenstates describing all combinations of atoms in the lower and upper energy levels. Equations for the corresponding probability amplitudes are derived by substituting this superposition into the Schrödinger equation. The resulting equations are combined into bilinear form and phenomenological damping contributions are added. After the neglect of certain of the bilinear quantities, a master equation is derived which governs the probability  $P_m^n$  of having  $m$  atoms in the lower level and  $n$  photons in the mode. This master equation takes account of multiple single-quantum absorption and emission processes but not of simultaneous multiple processes involving two or more atoms at a time. The equation which governs the expected number of photons ( $\bar{n}$ ) derived from the master equation bears a close resemblance to a rate equation. The effect of radiation loss from the cavity is incorporated into the master equation. Numerical calculations for a Q-spoiled laser show that the statistics of the number of photons in the mode bear a qualitative resemblance to Poisson statistics.

(Author)

**A66-41374****QUANTUM THEORY OF LASER RADIATION. II - STATISTICAL ASPECTS OF LASER LIGHT.**

J. A. Fleck, Jr. (California, University, Lawrence Radiation Laboratory, Livermore, Calif.).  
Physical Review, 2nd Series, vol. 149, Sept. 9, 1966, p. 322-329. 15 refs.

AEC-sponsored research.

Solution of a master equation to obtain the diagonal elements of the density matrix for laser light. The master equation represents a generalization of a master equation derived earlier for a single radiation mode interacting with  $N$  stationary two-level atoms. The generalization takes into account the pumping scheme which characterizes a three-level laser. For positive temperatures and a lossless cavity, the equilibrium solution of the master equation gives the correct statistical-mechanical description of the atoms and radiation. For negative temperatures, the distribution function for the number of photons in the mode is either exponential or peaked, depending on whether the laser is operating below or above threshold. The calculated intensity fluctuations are in good agreement with semiclassical results for lasers operating slightly above threshold.

(Author)

**A66-41409 #****BREAKDOWN CAUSED BY A LASER BEAM IN TRANSPARENT DIELECTRICS [O RAZRUSHENIIAKH, VYZYVAEMYKH LAZERNYM PUCHKOM V PROZACHNYKH DIELEKTRIKAKH].**

B. M. Ashkinadze, V. I. Vladimirov, V. A. Likhachev, S. M. Ryvkin, V. M. Salmanov, and I. D. Iaroshetskii (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR).  
Akademiia Nauk SSSR, Doklady, vol. 169, Aug. 11, 1966, p. 1041-1043. In Russian.

Study of the effects of a laser beam on hydrodynamic bearings made of polymethyl methacrylate, alkali-haloid crystals, and glass. Microcracks and other breakdowns caused by ordinary and giant pulses of coherent light from a laser are discussed. The critical energy observed was adequate to explain the beginning of breakdown as being caused by light pressure, electric breakdown, thermal heating, a shock wave, or similar effects. Failure of the materials under coherent hypersonic phonons may account for certain puzzling effects noted during the experiments. Heat explosion may be an important secondary effect near the focus of the laser beam. Breakdown under powerful light beams may be used to compare volumetric and surface strength.

W.A.E.

**A66-41449 #****REALIZATION OF AN EXTREMELY NARROW RADIATION PATTERN IN A LASER [O POLUCHENII PREDEL'NO UZKOI NAPRAVLENNOSTI IZLUCHENIIA OPTICHESKIKH KVANTOVYKH GENERATOROV].**

V. V. Liubimov.  
Optika i Spektroskopiia, vol. 21, Aug. 1966, p. 224-227. 6 refs. In Russian.

Theoretical estimation of the greatest permissible mirror misalignment, active medium inhomogeneity, and extra-axial beam losses in obtaining an artificially narrowed radiation pattern in a real laser. The theoretical results are in good agreement with the measured results.

V. Z.

**A66-41450 #****AMPLIFICATION OF SPONTANEOUS EMISSION IN MEDIA WITH INVERSE POPULATION [USILENIE SPONTANNOGO IZLUCHENIIA V SREDE S INVERNOI ZASELENNOST'IU].**

V. N. Morozov.  
Optika i Spektroskopiia, vol. 21, Aug. 1966, p. 230-232. In Russian.

Calculation of the spontaneous emission amplification for a uniform ruby rod with uniform pumping distribution. The path of photons is determined in one-dimensional approximation, assuming that most photons reflected from the lateral rod walls propagate along the rod length in both directions.

V. Z.

**A66-41452 #****SOME RESULTS OF A STUDY OF A PULSE-TYPE ARGON LASER [NEKOTORYE REZUL'TATY ISSLEDOVANIIA IMPUL'SNOGO GAZOVOGO LAZERA NA ARGONE].**

R. K. Leonov, E. D. Protzenko, and Iu. M. Sapunov.  
Optika i Spektroskopiia, vol. 21, Aug. 1966, p. 243, 244. 5 refs. In Russian.

Experimental study of the performance of an argon laser with an external interferential system of nearly confocal spherical mirrors. Radiation is obtained at pressures from  $1 \times 10^{-1}$  to  $7 \times 10^{-3}$  torr in eight lines of Ar II, in the blue-green region. V. Z.

**A66-41453 #**

RADIATION POWER OF A GAS LASER WITH NEARLY CONFOCAL RESONATORS [MOSHCHNOST' GENERATSII GAZOVOGO LAZERA V REZONATORAKH, BLIZKIKH K KONFOKAL'NOMU].

N. I. Kaliteevskii, M. M. Popov, Iu. A. Rymarchuk, T. B. Tolchinskaya, and M. P. Chaika.

*Optika i Spektroskopiia*, vol. 21, Aug. 1966, p. 258-260. 7 refs. In Russian.

Discussion of the mechanism of radiative power amplification in a neon-helium laser with nearly confocal resonators. Conditions for the production of minimum and maximum radiation power are given a qualitative analysis. V. Z.

**A66-41477 #**

PARASITIC "INTERNAL" MODES IN OPEN CAVITIES WITH DIELECTRIC ROD.

A. L. Mikaelian and Iu. G. Turkov.

*(Radiotekhnika i Elektronika)*, vol. 11, Feb. 1966, p. 347, 348.

*Radio Engineering and Electronic Physics*, vol. 11, Feb. 1966, p. 286, 287. Translation.

[For abstract see issue 11, page 1712, Accession no. A66-22739]

**A66-41510**

SCHLIEREN PHOTOGRAPHY OF RAIL-TUBE PLASMAS.

J. R. MacLelland, A. S. V. MacKenzie, and J. Irving (Strathclyde University, Dept. of Natural Philosophy, Glasgow, Scotland). *Physics of Fluids*, vol. 9, Aug. 1966, p. 1613-1615.

Study of schlieren photographs of discharges in a parallel plate rail-tube using a pulsed ruby laser as a light source. The photographs show more detail than previously observed and reveal some new facts about the structure of the discharge. Additional structures are shown developing in front of the discharge. It is noted that in another picture, new current-carrying fronts appear to have developed in front of the main electron front. The appearance of the schlieren photographs varies markedly with initial pressure. At high pressures (4 to 10 torr), there is a granular appearance whereas at low pressures (0.15 torr) the pictures have a smooth uniform appearance. The main discharge, however, remains at right angles to the electrodes even at lower pressures. No satisfactory explanation has been suggested for this variation in appearance, and no indication of it shows up on the framing camera pictures. M. F.

**A66-41621 #**

THERMAL EFFECTS IN GaAs SEMICONDUCTOR QUANTUM GENERATORS [NEKOTORYE TEPLOVYE EFFEKTY V POLUPROVODNIKOVYKH KVANTOVYKH GENERATORAKH IZ GaAs].

V. S. Bagaev, Iu. N. Berozashvili, V. S. Ivanov, B. D. Kopylovskii, and Iu. N. Korolev (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*Pribory i Tekhnika Eksperimenta*, vol. 11, July-Aug. 1966, p. 185-189. 8 refs. In Russian.

Study of the processes of heating a semiconductor quantum generator during the injection pulse and of the effect of heating on radiation. Superheating is determined by the bias in the generation modes. The measured magnitude of superheating  $\Delta T$  provided the basis for determining the value of the external quantum output  $\eta_{\text{ext}}$  and the efficiency of the generator. The value of  $\eta_{\text{ext}}$  and the efficiency coefficient are in satisfactory agreement with the values calculated directly from measuring the radiation intensity of the generator. In practice, to prevent the heating of the sample during the intensification of the injection pulse, a pulse generator with high-frequency transistors was developed. S. Z.

**A66-41624**

INTERACTION OF LINEARLY AND CIRCULARLY POLARIZED FIELDS IN A LASER AMPLIFIER WITH AN AXIAL MAGNETIC FIELD.

Andrew Dienes (California Institute of Technology, Pasadena, Calif.).

*Applied Physics Letters*, vol. 9, Aug. 15, 1966, p. 142-145. 9 refs. USAF-supported research.

Results of an analysis, based on the  $J = 1 - J = 0$  model of Fork and Sargent, of the interaction of various linearly and circularly polarized waves in a laser amplifier with an axial magnetic field. Emphasis is placed on combination tone production not considered elsewhere. The differential equations for the density matrix are formally integrated to obtain a set of integral equations in which qualitative features of the theory are apparent. The effect of increasing Doppler width on the nonlinear interaction of two waves is discussed, assuming an arbitrary amount of Doppler broadening. The results on combination tone generation are compared to those of Close for arbitrary linearly polarized fields, using Lamb's model of two nondegenerate levels. A. B. K.

**A66-41627**

DIRECT SPECTROSCOPIC DETECTION OF RUBY LASER GIANT PULSE OFF-AXIAL MODE STRUCTURE.

Daniel J. Bradley, Malcolm S. Engwell, A. W. McCullough (London, University, Royal Holloway College, Englefield Green, Surrey, England), George Magyar, and Martin C. Richardson (United Kingdom Atomic Energy Authority, Atomic Energy Research Establishment, Culham Laboratory, Culham, Berks., England).

*(International Commission for Optics Congress, 7th, Paris, France, May 2-7, 1966, Paper.)*

*Applied Physics Letters*, vol. 9, Aug. 15, 1966, p. 150-152. 6 refs.

Observation of off-axial modes of giant-pulse ruby lasers, including single off-axial-mode output, using a high-resolution spherical Fabry-Pérot interferometer. Typical spectra of the outputs of slow- and fast-switched giant-pulse lasers are obtained. In the case of the slow-switched laser off-axial-mode structure is observed in the two main components, which are themselves separated by five axial-mode spacings. In the case of the fast-switched laser single off-axial-mode output is obtained by pumping very near threshold. A. B. K.

**A66-41630**

TIME AND SPATIALLY RESOLVED INTERFEROMETRY ON PULSED-LASER-INDUCED PLASMAS.

C. W. Bruce, J. Deacon, and D. F. Vonderhaar (USAF, Systems Command, Research and Technology Div., Weapons Laboratory, Kirtland AFB, N. Mex.).

*Applied Physics Letters*, vol. 9, Aug. 15, 1966, p. 164-166. 8 refs. ARPA-supported research.

A technique is described for the measurement of plasma density. Multiple beam interferometry gives simultaneous time and position information on the state of the laser-induced plasma. Experiments using a single interferometric probe at various distances from the target surface along the incident laser axis indicates that the leading edge of the blowoff absorbs a portion of the incident energy and hence additional fringe shifts are observed. (Author)

**A66-41631**

COMPETITION, HYSTERESIS AND REACTIVE Q-SWITCHING IN CO<sub>2</sub> LASERS AT 10.6 MICRONS.

T. J. Bridges (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

*Applied Physics Letters*, vol. 9, Aug. 15, 1966, p. 174-176. 7 refs.

High repetition rate (30 to 60 kc) Q-switching in a CO<sub>2</sub> laser at 10.6  $\mu$  is reported. A moving mirror technique using steady mirror velocities between 16 and 30 cm/sec produces one pulse of the strongest line (P(20)) per half wavelength of travel. The usable pulsing rate is determined by, and is a measure of, the lower laser level lifetime ( $\sim 30 \mu\text{sec}$ ). In a 1-watt CW laser, peak powers  $\approx 30$  watts with pulse lengths  $\approx 1 \mu\text{sec}$  and average power  $\approx$  CW power were obtained. This and related competition and hysteresis effects result from strong coupling between the lines of the vibrational-rotational spectrum due to thermalizing molecular collisions. (Author)

**A66-41675 #****A MULTI-PURPOSE ULTRA HIGH SPEED CAMERA SYSTEM.**

W. J. Schenck (Electro-Optical Systems, Inc., Electro-Optical Instruments Div., Pasadena, Calif.).

IN: ELECTRONIC IMAGING TECHNIQUES FOR ENGINEERING, LABORATORY, ASTRONOMICAL AND OTHER SCIENTIFIC MEASUREMENTS; PROCEEDINGS OF THE THIRD ANNUAL SEMINAR-IN-DEPTH, LOS ANGELES, CALIF., APRIL 26, 27, 1965. [A66-41664 23-14]

Seminar sponsored by the Society of Photo-optical Instrumentation Engineers and the U.S. Navy.

Redondo Beach, Calif., Society of Photo-optical Instrumentation Engineers, 1965, p. XI-0 to XI-20. 6 refs.

Description of a high voltage pulse modulator system and accessory hardware which enables it to be used as a single exposure nanosecond Kerr cell or image converter camera system and also as a triggerable Q-switch for a generation of giant laser pulses. With a wide family of interchangeable pulse-forming networks, a wide spectrum of laser Q-spoiling and high speed photographic applications can be studied using a single instrument package.

M. F.

**A66-41701 #**

POSSIBLE APPLICATIONS OF LASER TECHNOLOGY IN EXPERIMENTS WITH EXPLOSIVE WIRES [MOŻLIWOŚCI ZASTOSOWANIA TECHNIKI LASEROWEJ W DOŚWIADCZENIACH Z ELEKTRYCZNYMI WYBUCHAMI DRUCIKÓW].

Waldemar Soszka (Kraków, Uniwersytet, Instytut Fizyki, Krakow, Poland).

Postępy Fizyki, vol. 17, no. 4, 1966, p. 403-419. 22 refs. In Polish.

Discussion of the exploding-wire phenomenon, using a slow explosion model, a supersonic model, and an ablation model to explain its physical nature. An attempt is made at classifying wire explosions on the basis of the Chace and Webb classifications. Applications of laser technology in plasma physics are examined, with particular reference to the plasma induced during the last stage of the explosion. Interference methods used to measure plasma parameters and methods based on studying of the light-scattering at the plasma electrons and ions are reviewed. The possibility of using laser techniques to acquire information on the initial phase of the explosion is assessed. The results of an experiment concerning the explosion of a metal cylinder are examined, yielding substantial information on the nature of the explosion and insight into the buildup process of converging waves in a vacuum.

V. P.

**A66-41743 #**

CURRENT TECHNOLOGY AND PROSPECTS FOR THE TECHNICAL USE OF THE PHENOMENON OF SUPERCONDUCTIVITY [SOVREMENNOE SOSTOIANIE I PERSPEKTIVY TEKHNIЧЕСКОГО ISPOL'ZOVANIYA IAVLENIIYA SVERKHPROVODIMOSTI].

V. V. Sychev.

(Akademiia Nauk SSSR, Otdelenie Fiziko-Tekhnicheskikh Problem Energetiki, Obshchee Sobranie, Moscow, USSR, Feb. 5, 1966.)

Akademiia Nauk SSSR, Izvestiia, Energetika i Transport, July-Aug. 1966, p. 26-32. 15 refs. In Russian.

Survey of the present level of engineering applications of the superconductivity phenomenon, chiefly concerned with U.S. and British developments. The applications of superconductor solenoids in laser devices and for the development of magnetic plasma traps for research in controlled thermonuclear reactions are discussed. Logic elements (cryotrons) and memory cells based on superconductivity effects are finding increased application in computing equipment. The use of superconductivity in space flight (as, for example, in generating a protective magnetic field around a space ship to shield it against radiation) is considered. Some methods of producing superconductors and superconducting systems are mentioned.

W. A. E.

**A66-41760 #****BIPOLAR NICKEL-CADMIUM CELLS FOR HIGH ENERGY PULSES.**

Harvey N. Seiger, Arthur E. Lyall (Gulton Industries, Inc., Alkaline Battery Div., Research Laboratory, Metuchen, N.J.), and Steven Charlip (Gulton Industries, Inc., Alkaline Battery Div., Research Laboratory, Engineering Development Section, Metuchen, N.J.).

IN: INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE, LOS ANGELES, CALIF., SEPTEMBER 26-28, 1966, TECHNICAL PAPERS. [A66-41744 23-03]

Conference sponsored by the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, the Institute of Electrical and Electronics Engineers, the American Institute of Chemical Engineers, the American Nuclear Society, and the Society of Automotive Engineers.

New York, American Institute of Aeronautics and Astronautics, 1966, p. 271-278. 6 refs.

Contracts No. DA-101-021-AMC-12509(Z); No. NAS 5-10160.

Development of bipolar batteries for ruby lasers and power sources to fire pyrotechnic devices. The problems encountered in this development and solved individually were (1) the fabrication of thin sintered matrices; (2) the impregnation with active materials on one side of the bipolar electrode at a time; and (3) overcoming electrolyte leakage. An ancillary problem was the testing of cells at high currents and low voltages. Since a bipolar battery necessitates a sealed cell concept if it is to be rechargeable, the nickel-cadmium system is an obvious choice for the electrochemical system. This is the best understood of sealed cell batteries. Maximum power delivered into a load occurs at 0.65 v. Cells designed for millisecond discharge yield 450 watts/lb. Short circuit current density is 20 amp/in<sup>2</sup>. A thicker matrix cell designed for discharge of 1 sec delivers 33 watts/in<sup>2</sup>, which corresponds to 180 watts/lb.

M. F.

**A66-41830 #**

EFFECT OF RESONATOR MISALIGNMENT ON THE OUTPUT OF A NEON-HELIUM LASER [VLIYANIE RAZ'USTIROVKI REZONATORA NA VYKHODNUIU MOSHCHNOST' NEON-GELIEVOGO LAZERA].

F. A. Korolev, A. I. Odintsov, and K. Kelov (Akademiia Nauk Turkmenskoi SSR, Fiziko-Tekhnicheskii Institut, Ashkhabad, Turkmen SSR).

Akademiia Nauk Turkmenskoi SSR, Izvestiia, Seriia Fiziko-Tekhnicheskikh, Khimicheskikh i Geologicheskikh Nauk, no. 4, 1966, p. 16-22. 7 refs. In Russian.

Consideration of the effect of mirror misalignment in a laser with spherical mirrors. When many transverse types of oscillations are being generated, a considerable misalignment (up to three minutes of angle) of the mirrors is permissible; the magnitude of the maximum misalignment angle is practically independent of the generator output and only slightly dependent on the length of the resonator. However, when the basic type of oscillations is separated by means of a diaphragm, alignment requirements are more rigid: maximum permissible misalignment is less than one minute. The limiting angle decreases as the output decreases and as the resonator length increases. In this case, however, permissible misalignment is much greater than for a resonator with plane-parallel mirrors.

W. A. E.

**A66-42076****CHEMICAL REACTIONS INDUCED IN GASES BY MEANS OF A LASER.**

L. M. Epstein and K. H. Sun (Westinghouse Electric Corp., Atomic, Defense and Space Group, Research and Development Center, Research Laboratories, Pittsburgh, Pa.).

Nature, vol. 211, Sept. 10, 1966, p. 1173, 1174.

Description of the preliminary results of an analysis of the composition of the residual gases in the induction of chemical reactions in condensed phases by means of a laser. Although the temperature within the directly irradiated volume was sufficient to cause complete dissociation and ionization, the low overall energy



## A66-42085

requirements imply that the number of molecules decomposed far exceeded the number originally ionized, and that most of the molecules decomposed received their energy indirectly. The pattern of product formation is what would be expected from high temperature reactions rather than from ionizing radiation. This is clearly shown in the methane results by the small yield of ethane or other derivatives of methyl radicals and, in general, by the lack of any product molecules more complex than the starting materials. M.M.

### A66-42085 #

THE PROBABLE IODINE MOLECULAR LASERS IN THE VIOLET AND ULTRAVIOLET REGIONS.  
Putcha Venkateswarlu and D. Ramachandra Rao (Institute of Higher Technology, Dept. of Physics, Kanpur, India).  
Indian Academy of Sciences, Proceedings, Section A, vol. 64, July 1966, p. 9-12. 14 refs.

Discussion of the suitability of transitions of the first two band systems of iodine excited in the presence of argon for laser action. It is indicated that the transitions involving the first two band systems are suited to laser action due to their great strength and the efficient flushing out of their common lower state due to the crossing or touching of an  $O_2$ -repulsive state. Tuning of the interferometer system is expected to make this laser action possible over a wide range of frequencies. B. B.

### A66-42123 #

SPECTRAL DISTRIBUTION OF THE LUMINESCENCE YIELD OF RUBY.

Z. L. Morgenshtern and V. V. Neustruev.  
(Optika i Spektroskopiia, vol. 20, May 1966, p. 837-841.)  
Optics and Spectroscopy, vol. 20, May 1966, p. 464-466. 16 refs.  
Translation.  
[For abstract see issue 17, page 2938, Accession no. A66-33509]

### A66-42124 =

STUDY OF THE COHERENCE OF RUBY LASER EMISSION IN PEAKS.

I. I. Dukhopel, T. V. Simonenko, and I. E. Urnis.  
(Optika i Spektroskopiia, vol. 20, May 1966, p. 853-858.)  
Optics and Spectroscopy, vol. 20, May 1966, p. 473-475. 11 refs.  
Translation.  
[For abstract see issue 17, page 2938, Accession no. A66-33510]

### A66-42125 #

MEASUREMENT OF THE AMPLIFICATION OF COHERENT OPTICAL RADIATION IN A TUBE WITH A HELIUM-NEON MIXTURE.  
A. P. Skibarko and Iu. V. Prichko.

(Optika i Spektroskopiia, vol. 20, May 1966, p. 908-910.)  
Optics and Spectroscopy, vol. 20, May 1966, p. 502, 503. Translation.

[For abstract see issue 17, page 2938, Accession no. A66-33512]

### A66-42127 #

ON THE COMPETITION OF TRANSITIONS AND THE ACHIEVEMENT OF LASER ACTION AT  $6401 \text{ \AA}$  WITHOUT A DISPERSING PRISM IN THE RESONATOR OF A He-Ne LASER.

L. S. Vasilenko and V. P. Chebotaev.  
(Optika i Spektroskopiia, vol. 20, May 1966, p. 915, 916.)  
Optics and Spectroscopy, vol. 20, May 1966, p. 507. Translation.  
[For abstract see issue 17, page 2938, Accession no. A66-33514]

### A66-42128 #

THEORETICAL STUDY OF CONTROL OF GENERATION IN A RUBY LASER USING AN ULTRASONIC TRAVELING WAVE DIFFRACTION MODULATOR.

A. G. Pokorvskii and M. A. Filippova.  
(Optika i Spektroskopiia, vol. 20, May 1966, p. 921-923.)  
Optics and Spectroscopy, vol. 20, May 1966, p. 512, 513. 6 refs.  
Translation.  
[For abstract see issue 17, page 2938, Accession no. A66-33515]

### A66-42129 #

EXPERIMENTAL INVESTIGATION OF THE CONTROL OF RUBY LASER GENERATION BY MEANS OF DIFFRACTION MODULATION WITH A TRAVELING ULTRASONIC WAVE.

I. I. Adrianova, Iu. V. Popov, and V. E. Terent'ev.  
(Optika i Spektroskopiia, vol. 20, May 1966, p. 924-926.)  
Optics and Spectroscopy, vol. 20, May 1966, p. 514, 515. Translation.

[For abstract see issue 17, page 2938, Accession no. A66-33516]

### A66-42133 #

ESTIMATION OF RADIATION SPECTRAL WIDTH FOR SOLID-BODY LASERS IN NONSTATIONARY REGIME [OTSENKA SPECTRAL'NOI SHIRINY IZLUCHENIIA TVERDOTEL'NYKH OKG, RABOTAIUSHCHIKH V NESTATSIONARNOM REZHIME].

A. M. Samson (Akademiia Nauk Belorusskoi SSR, Institut Fiziki, Minsk, Belorussian SSR).  
Akademiia Nauk BSSR, Doklady, vol. 10, Aug. 1966, p. 553-557. 13 refs. In Russian.

Derivation of formulas describing the spectral width of peak-type and monopulse-type radiation of a laser with a solid active body. It is found that in the case of several modes, a laser radiation spectrum contains a set of discrete frequencies, with lines of definite widths belonging to definite individual modes. V. Z.

### A66-42247

STIMULATED EMISSION FROM POLYMETHINE DYES.

M. L. Spaeth and D. P. Bortfeld (Hughes Aircraft Co., Aerospace Group, Culver City, Calif.).  
Applied Physics Letters, vol. 9, Sept. 1, 1966, p. 179-181. 9 refs.  
Contract No. DA-28-043-AMC-01237(E).

Stimulated emission is reported for two polymethine dyes dissolved in glycerol when pumped by a Q-switched ruby laser. The materials are 1, 1'-diethyl-2, 2'-dicarbocyanine iodide, and 1, 1'-diethyl-4, 4'-carbocyanine iodide. The emission wavelength is variable over the range 750 nm to 790 nm, depending on cell length. Oscillation has been observed on both the 0-0 and 0-1 vibrational transitions. (Author)

### A66-42248

ZEEMAN LASER INTERFEROMETER.

J. A. Dahlquist, D. G. Peterson, and W. Culshaw (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Research Laboratories, Palo Alto, Calif.).

Applied Physics Letters, vol. 9, Sept. 1, 1966, p. 181-183. 9 refs.  
Research supported by the Lockheed Independent Research Fund.

A laser interferometer which utilizes some Zeeman laser properties has been built and operated. The application of an axial magnetic field constrains a two-mode 633-nm He-Ne laser to oscillate simultaneously as left- and right-hand circularly polarized modes at the upper and lower cavity resonances, respectively. The two modes, separated by a quarter-wave plate and polarizers, are sent through different arms of an interferometer, and are recombined and detected with a photomultiplier. Target motions in one arm, ranging from displacements of  $10^{-6}$  cm at 12 kc to 10 cm at 0.5 cps, produced easily resolvable signals in this heterodyne device. (Author)

### A66-42249

DIRECT OBSERVATION OF THE EXCESS LIGHT HOLE POPULATION IN OPTICALLY PUMPED p-TYPE GERMANIUM.

J. M. Feldman and K. M. Hergenrother (Northeastern University, Boston, Mass.).

*Applied Physics Letters*, vol. 9, Sept. 1, 1966, p. 186, 187. 6 refs. Research supported by the U.S. Public Health Service and USAF.

We report the direct observation of conductivity modulation by heavy-to-light hole transitions in p-type germanium. The resistance of a p-type germanium bar was modulated by microsecond pulses of 10- $\mu$  radiation from a Q-switched CO<sub>2</sub> laser. An estimate of the fast carrier lifetime is 10<sup>-12</sup> sec. Direct observation of 20-Mc ringing on the laser pulse is reported. The band-to-band type of transition permits room temperature operation. (Author)

#### A66-42251

AN ACOUSTIC LIGHT MODULATOR FOR 10.6  $\mu$ .

R. W. Dixon and A. N. Chester (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

*Applied Physics Letters*, vol. 9, Sept. 1, 1966, p. 190-192. 1 refs.

Bragg diffraction from longitudinal acoustic waves in tellurium is employed to modulate the 10.6- $\mu$  output of a CO<sub>2</sub>-He laser. Two of the photoelastic tensor components are obtained, and it is shown that the efficiency with which an acoustic wave in tellurium diffracts light greatly exceeds that of any other known material. (Author)

#### A66-42253

INVESTIGATION OF SPECTRAL BLEACHING IN PASSIVE Q-SWITCH DYES.

C. R. Giuliano and L. D. Hess (Hughes Aircraft Co., Research Laboratories, Malibu, Calif.).

*Applied Physics Letters*, vol. 9, Sept. 1, 1966, p. 196-198. 6 refs. USAF-Army-supported research.

The bleaching characteristics of saturable dyes have been studied by varying the spectral width of a Q-switched ruby laser. Recent reports of mode selection properties of dyes used as passive Q switches and of absorption spectra of dyes while in the bleached state have been interpreted in terms of narrow spectral saturation ("hole-burning"). This view implies that certain dyes have inhomogeneously broadened absorption bands consisting of relatively narrow components. Our results indicate that the lower limit to the width of these components for cryptocyanine is  $\sim 1$  cm<sup>-1</sup>. (Author)

#### A66-42254

THE EFFECT OF ABSORBER CONCENTRATION ON A PULSED LASER SYSTEM.

C. Y. She and Ang-Tiek Tan (Minnesota, University, Dept. of Electrical Engineering, Minneapolis, Minn.).

*Applied Physics Letters*, vol. 9, Sept. 1, 1966, p. 198-200. 6 refs. Research supported by the University of Minnesota; NSF Grant No. GK-252.

The threshold energy and the time of yielding the first laser pulse as a function of absorber concentration are experimentally determined. In cooperation with the coupled rate equations of the system, the effect of absorber concentration on the performance of a pulsed laser system is studied. The experimental data are processed in such a way to allow a direct determination of pumping dynamics through the parameters  $n_c$  and  $t_p$ , and to measure the relative absorption cross section of cryptocyanine and ruby by observing the laser output only. (Author)

#### A66-42257

DERIVATION OF THE RELATION BETWEEN TWO WEAKLY COUPLED NONLINEAR OPTICAL OSCILLATORS.

H. de Lang (Philips' Gloeilampenfabrieken, Philips Research Laboratories, Eindhoven, Netherlands).

*Applied Physics Letters*, vol. 9, Sept. 1, 1966, p. 205-207. 10 refs.

Derivation of an expression for the time-dependence of the phase difference of two weakly coupled nonlinear optical oscillators. As examples, consideration is given to the coupling between the two traveling waves in a ring laser, the case of a rotating circular He-Ne ring laser with a lossless mirror coupling the two traveling waves, and the case of two weakly coupled, identical, slightly detuned planar gas lasers which are lasing at a  $j = 2 - j = 2$  transition. B. B.

#### A66-42302

SIMULTANEOUS GIANT PULSES FROM FIVE RUBY LASER OSCILLATORS.

David W. Gregg and Scott J. Thomas (California, University, Lawrence Radiation Laboratory, Livermore, Calif.).

*Journal of Applied Physics*, vol. 37, Sept. 1966, p. 3750-3753. AEC-sponsored research.

A laser system using bleachable-filter Q-switching has enabled us to obtain simultaneous "giant pulses" from five ruby laser oscillators. The beams from the different oscillators were found to be phase-locked; the beam divergence was limited by the initial ruby quality. Two other systems for obtaining simultaneous giant pulses were investigated. One involved using the giant pulse from one oscillator to switch the bleachable cells in other oscillators; the other consisted of feeding the giant pulse from one oscillator into a branching chain of amplifiers. These latter systems proved less desirable for expansion to a large number of laser rods. (Author)

#### A66-42319

THE LASER.

W. V. Smith and P. P. Sorokin (International Business Machines Corp., Thomas J. Watson Research Center, Yorktown Heights, N.Y.).

Research supported by the U.S. Army and the International Business Machines Corp.

New York, McGraw-Hill Book Co., 1966. 498 p.

\$15.50.

A comprehensive and unified book on the laser, based on the original research of the authors, is offered as a text or reference for graduate courses in quantum electronics or applied optics, as well as to scientists and engineers in industries concerned with the new types of lasers and their applications. The principle of stimulated emission which is responsible for the properties of lasers and masers is explained, and the properties of the several different types of lasers which have been developed are described. The related scientific background, particularly spectroscopic, is developed where necessary, and some applications, both scientific and technological, are discussed - including nonlinear optical effects associated with the high coherent field obtained. The nature of coherence, both in time and space, and its relevance to communication applications, are investigated. M. M.

#### A66-42367

STUDY OF THE PROPAGATION CHARACTERISTICS OF A TROPOSPHERIC RADIO LINK BY THE USE OF A LABORATORY MODEL.

W. G. Burrows (Hatfield College of Technology, Dept. of Electrical Engineering and Physics, Hatfield, Herts., England).

*Electronics Letters*, vol. 2, Sept. 1966, p. 325.

Brief description of an investigation of tropospheric propagation using a scaled-down model with a laser replacing the radio transmitter. Experience gained in the development of the model indicates that the effects of various types of tropospheric air-mass movements on tropospheric radio links can be investigated. The present program will include investigations of the effects of Bénard cells, turbulence, fronts, and wind-shear processes. S. Z.

#### A66-42514 #

HYPER SOUND ABSORPTION IN QUARTZ AND RUBY CRYSTALS [POGLOSHCHENIE GIPERZVUKA V KRISTALLAKH KVARTSA I RUBINA].

E. M. Ganapol'skii and A. N. Chernets (Akademii Nauk Ukrainskoi SSR, Institut Radiofiziki i Elektroniki, Kharkov, Ukrainian SSR).

*Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, vol. 51, Aug. 1966, p. 383-393. 18 refs. In Russian.

Measurement of the frequency-temperature dependences of the absorption coefficients of longitudinal and transverse hypersonic waves in single-crystal natural  $\alpha$ -quartz and of longitudinal waves in an artificial ruby crystal. It is found that three-phonon scattering of longitudinal and transverse external hypersonic quanta on longitudinal and transverse thermal phonons, respectively, is responsible for hypersound absorption at low temperatures. This process is used to explain the fanlike shape of the frequency-temperature dependences of the hypersound absorption coefficient. A. B. K.

**A66-42516 #**

STRUCTURE OF A GIANT LASER EMISSION PULSE WITH INSTANTANEOUS Q-SWITCHING [STRUKTURA GIGANTSKOGO IMPUL'SA IZLUCHENIA LAZERA S MGNOVENNYM VKLIUCHENIEM DOBROT-NOSTI].

R. V. Ambartsumian, N. G. Basov, V. S. Zuev, P. G. Kriukov, V. S. Letokhov, and O. B. Shatberashvili (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, vol. 51, Aug. 1966, p. 406-411. 13 refs. In Russian.

Experimental study of the range of generation of a giant pulse in the transverse direction after Q switching in a ruby laser. It is shown that generation begins in the center of the crystal and spreads throughout the crystal in about 3 to 10 nsec. The effect of the resonator properties on the spatial development of the generation is investigated. The results of the experiments are said to be in qualitative agreement with the theory. A. B. K.

**A66-42543**

PHOTOELECTRON STATISTICS PRODUCED BY A LASER OPERATING BELOW AND ABOVE THE THRESHOLD OF OSCILLATION. C. Freed (Massachusetts Institute of Technology, Lincoln Laboratory Lexington, Mass.) and H. A. Haus (Massachusetts Institute of Technology, Dept. of Electrical Engineering and Research Laboratory of Electronics, Cambridge, Mass.).

(International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

*IEEE Journal of Quantum Electronics*, vol. QE-2, Aug. 1966, p. 190-195. 18 refs.

Contract No. DA-36-039-AMC-03200(E).

A simple semiclassical derivation is given of the statistics of the photoelectrons emitted from a photosurface illuminated by light with statistically time dependent intensity. Comparison is made with the quantum mechanical expressions. Experiments are described that yield the probability of emission of  $n$  photoelectrons within a fixed time interval from a photocathode illuminated by a laser below and above threshold. The experimental results are compared with the theory developed in this paper and expressions derived by Glauber. (Author)

**A66-42544**

INFRARED DIFFERENCE FREQUENCY GENERATION.

M. D. Martin and E. L. Thomas (Ministry of Aviation, Signals Research and Development Establishment, Christchurch, Hants., England).

(International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

*IEEE Journal of Quantum Electronics*, vol. QE-2, Aug. 1966, p. 196-201. 10 refs.

Several molecular vibrational frequencies have been generated by beating together a laser and laser-stimulated Raman emission. A  $\text{Nd}^{3+}$ /glass laser was used to excite Raman emission from  $\text{C}_6\text{H}_6$ ,  $\text{C}_6\text{D}_6$ , and  $\text{CH}_3\text{-NO}_2$ . The difference frequencies were generated in a single crystal of  $\text{CdS}$  and appeared at 992, 944, and  $927\text{ cm}^{-1}$ , respectively. A difference frequency has also been detected at  $944\text{ cm}^{-1}$  following mixing in  $\text{CdSe}$ . The data presented for  $\text{HgS}$  indicates that phase-matched outputs can be generated over a limited range of frequencies, provided that the Raman emission is excited with a  $\text{Nd}^{3+}$ /glass laser. Experimental details are given and the results are discussed. (Author)

**A66-42545**

CYCLOTRON RESONANCE IN SEMICONDUCTORS WITH FAR INFRARED LASER.

K. J. Button, B. Lax (Massachusetts Institute of Technology, National Magnet Laboratory, Cambridge, Mass.), and H. A. Gebbie (Ministry of Technology, National Physical Laboratory, Teddington, Middx., England).

(International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

*IEEE Journal of Quantum Electronics*, vol. QE-2, Aug. 1966, p. 202-207. 14 refs.

The quantum effects in the degenerate valence bands of germanium have been observed as multiple cyclotron resonance absorption lines at a temperature of  $165^\circ\text{K}$ . Additional lines were resolved at  $40^\circ\text{K}$ . The combination of high intensity magnetic fields up to 180,000 gauss and the output power of a cyanide submillimeter laser (0.337 mm) was used. The construction and operation of a simple resonance spectrometer is described. Cryogenic techniques and the choice of detectors are discussed. The possible use of molecular gas laser spectrometers for EPR, ferrimagnetic resonance, and antiferromagnetic resonance at submillimeter wavelengths is considered. (Author)

**A66-42546**

ANALYSIS OF ROOM TEMPERATURE CW RUBY LASERS.

Dieter Roess (Siemens und Halske AG, Zentrallaboratorien, Munich, West Germany).

(International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

*IEEE Journal of Quantum Electronics*, vol. QE-2, Aug. 1966, p. 208-214. 12 refs.

Ruby lasers of between 10 mm and 75 mm length were operated continuously at room temperature in ellipsoidal pumping systems. Mode selection, relaxation oscillations, mode interaction, and thermal effects are described. CW operation was also studied with external mirrors, in 100-cps giant pulse emission, and in single-mode emission. A ruby pulslaser is described, that can be operated in 1-msec pulses at 50 to 120 cps. (Author)

**A66-42547**

LASER EXPERIMENTS FOR DETERMINING SATELLITE ORBITS.

P. H. Anderson, C. G. Lehr, L. A. Maestre (Smithsonian Institution, Smithsonian Astrophysical Observatory, Cambridge, Mass.), and G. L. Snyder (General Electric Co., Missile and Space Div., King of Prussia, Pa.).

(International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

*IEEE Journal of Quantum Electronics*, vol. QE-2, Aug. 1966, p. 215-219. 11 refs.

Grant No. NSG-87-60.

The results from a series of experiments at the Smithsonian Astrophysical Observing Station, Organ Pass, N. Mex., indicate how lasers may be used to supplement the worldwide network of Baker-Nunn cameras in obtaining precise satellite orbits for geodesy and other purposes. A pulsed ruby laser and photoelectric receiver were located at the observing station. Laser returns were obtained from the three satellites equipped with retroreflectors. The problem of aiming the laser so that its narrow beam reaches the satellite is discussed for the cases of the satellite in sunlight and in shadow. The value of the limiting range obtained experimentally is compared with that calculated from the range equation and from measurements and estimates of the background noise. Range measurements made with the laser system are compared with values determined from the orbit computations based on observations from the Baker-Nunn network. The effects of the earth's atmosphere are discussed. (Author)

**A66-42548**

INTENSITY FLUCTUATIONS IN THE OUTPUT OF LASER OSCILLATORS.

D. E. McCumber (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

(International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

*IEEE Journal of Quantum Electronics*, vol. QE-2, Aug. 1966, p. 219-221.

Using population rate equations, we have calculated the intrinsic intensity fluctuations expected in the output of 3-level and 4-level CW laser oscillators. Such fluctuations stem from the quantum shot noise implicit in a restriction of the atomic and photon population-operator eigenvalues to discrete integral values (in the manner of

Shimoda, Takahashi, and Townes). The intrinsic fluctuations below threshold are typical of a Gaussian distribution of EM field amplitudes (Bose-Einstein distribution of photons) and above threshold of an amplitude-stabilized EM field (Poisson distribution of photons). The noise properties of 3-level and 4-level lasers are qualitatively similar, although for a given output power the intensity fluctuations of 3-level oscillators are greater than (or equal to) those in 4-level oscillators, principally as a consequence of the increased spontaneous emission associated with the larger upperstate occupation necessary to achieve a net gain in 3-level systems. (Author)

#### A66-42549

##### RADIATION INTERACTIONS BETWEEN LASER OSCILLATORS WITH DIFFERENT ACTIVE ELEMENTS AND DIFFERENT FREQUENCY.

H. Inaba, Y. Isawa, and N. Suda (Tohoku University, Research Institute of Electrical Communication, Sendai, Japan).

(International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Aug. 1966, p. 222-229. 14 refs.

The paper presents a novel problem in laser dynamics, where two lasers using different active material with different frequency produce radiation interaction. In the first experiment, we performed a study on the effect of radiation coupling of the giant pulse ruby laser on the  $\text{Nd}^{3+}$ -glass laser under normal oscillation. It was found that the sudden enhancement followed by the quenching of oscillation in the  $\text{Nd}^{3+}$ -glass makes a short, intense pulse, which was one order of magnitude or more larger than usual oscillating spikes, after the excitation by the Q-switched ruby laser light. In order to explain this result, the fluorescence study of the  $\text{Nd}^{3+}$ -glass in the range of the visible and near infrared spectrum was arranged by employing the giant pulse ruby laser as an exciting source. This measurement has led to valuable information on the energy levels of the  $\text{Nd}^{3+}$ -ion in the glass host through the new observation of fluorescence lines in the visible spectral region. Hence it was found that the ruby laser radiation is properly responsible for two upward transitions from the ground state in the  $\text{Nd}^{3+}$ -glass, and thereby such radiation coupling yields the sudden enhanced emission in the laser output. (Author)

#### A66-42550

##### PRECISION SPECTROSCOPY OF NEW INFRARED EMISSION SYSTEMS OF MOLECULAR NITROGEN.

R. A. McFarlane (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

(International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Aug. 1966, p. 229-232. 8 refs.

Stimulated emission and laser oscillation resulting from transient population inversions on a number of electronic transitions of molecular nitrogen have made it possible to more accurately specify energy differences between several excited singlet states of the molecule and in one case, that of the  $w^1\Delta_u$  state, to more directly determine its absolute position with respect to the electronic ground state. Measurement accuracy has been improved on a system which we previously reported. A new emission system has been identified as resulting from transitions between the  $w^1\Delta_u$  state and the  $a^1\Pi_g$  state. We have observed for the first time in the unperturbed region at low J values  $\Lambda$  doubling in  $v = 0$  of  $a^1\Pi_g$ . Very complex emission systems of more than 80 lines falling into four groups between 5.35  $\mu$  and 8.06  $\mu$  have been observed. No identification has yet been made. (Author)

#### A66-42551

##### A ZERO-FIELD MASER OSCILLATOR.

W. E. Hughes (Westinghouse Electric Corp., Atomic, Defense and Space Group, Aerospace Div., Applied Physics Group, Baltimore, Md.).

(International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Aug. 1966, p. 233-235. 8 refs.

USAF-supported research.

A solid-state zero-field maser oscillator has been experimentally investigated to determine the power, stability, and spectral purity which may be expected in this type of device. The maser operates in a zero-field configuration and uses the ferric ion substituted as an impurity in an aluminum nitrate host crystal. Single crystal and powder samples were used in the experiments, and a comparison between the sample configuration is given. (Author)

#### A66-42552

##### MEASUREMENT OF SATURATION INDUCED OPTICAL NONRECIPROCALITY IN A RING LASER PLASMA.

P. H. Lee and J. G. Atwood (Perkin-Elmer Corp., Research Dept., Norwalk, Conn.).

(International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Aug. 1966, p. 235-243.

Contracts No. AF 33(615)-2059; No. NAS 8-11669.

When a gas laser plasma is illuminated by unequally intense laser beams traveling in opposing directions, its index of refraction becomes significantly nonreciprocal. We have studied this effect by measuring the beat frequency between the counter-rotating beams in a 6328-Å He-Ne ring laser under controlled conditions. Frequency locking was effectively eliminated by using a Faraday effect beat frequency bias element. The measured beat frequency became a strong function of two independent parameters: the ring resonator tuning and the beam intensity difference. A second Faraday effect element was introduced to control nonreciprocal losses within the ring resonator. Servo loops controlling both the total laser intensity and the intensity ratio between the counterrotating beams permitted direct measurement of the nonreciprocal gain caused by saturation, or hole burning. The effects observed are contained in Aronowitz' theoretical description of ring lasers. (Author)

#### A66-42553

##### GAAs AS AN ELECTROOPTIC MODULATOR AT 10.6 MICRONS.

A. Yariv, C. A. Mead (California Institute of Technology, Div. of Engineering and Applied Science, Pasadena, Calif.), and J. V. Parker (Electro-Optical Systems, Inc., Pasadena, Calif.).

(International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Aug. 1966, p. 243-245.

Contracts No. AF 33(615)-2800; No. Nonr-220(50).

The electrooptic properties of a number of semiconductors were investigated. Of particular interest was the possibility of using these materials for modulation of infrared radiation, since many of the efficient modulation materials for the shorter wavelengths, such as KTN and KDP, are opaque in this region. We have investigated experimentally the modulation potential of a number of semiconducting materials. These include ZnS and GaAs of the noncentrosymmetric 43m class. The electrooptic coefficients were determined by using a  $\text{Co}_2$  10.6- $\mu$  laser and a He-Ne 3.39- $\mu$  laser as the radiation source. Based on our experiments, GaAs appears as a suitable material for infrared modulation at  $\lambda > 10 \mu$ . (Author)

#### A66-42554

##### ON SELF-TRAPPING OF A LASER BEAM.

A. Piekara (Polska Akademia Nauk, Instytut Fizyki, Warszawa, Uniwersytet, Wydział Chemii, Warsaw, Poland).

(International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Aug. 1966, p. 249, 250. 9 refs.

When a sufficiently intense light beam propagates in an isotropic medium, the latter becomes birefringent with refractive index dependent on the even powers of the electric field strength. The permittivity also increases with the refractive index. Under such conditions, at very high intensities, a new effect arises: the light beam produces a kind of dielectric waveguide embracing that part of the medium where the dielectric permittivity has undergone an increase. At sufficient power of the beam the diffracted light is

totally reflected on the walls of this waveguide, and is unable to escape outwards; thus there arises a self-trapping "channel." By means of an electronic computer, data for calculating the function  $D = f(P)$  are obtained,  $D$  being the diameter of the self-trapping channel, and  $P$  the power of the light beam entering the medium. The shape of  $D = f(P)$  as computed numerically reveals a number of interesting features which are discussed and analyzed in detail.

(Author)

#### A66-42555

ENERGY TRANSFER AND CW LASER ACTION IN  $\text{Ho}^{3+}:\text{Er}_2\text{O}_3$ .  
R. H. Hoskins and B. H. Soffer (Korad Corp., Santa Monica, Calif.)  
(International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Aug. 1966, p. 253-255.

Contract No. AF 33(615)-1967.

$\text{Er}_2\text{O}_3:\text{Ho}^{3+}$  is an unusual laser material in that the host crystal itself provides the dominant pumping mechanism by means of energy transfer. The additional pumping bands due to  $\text{Er}^{3+}$  and the consequent efficient transfer of energy to the  $\text{Ho}^{3+}$  laser ion lead to relatively low threshold laser operation: 5 joules pulsed and 200 watts CW for a 12 mm long crystal at 77°K. The emission wavelength is 2.121  $\mu$ , a region of good atmospheric transmission. Additional laser experiments were carried out at 1450°K. Excitation and fluorescence spectra are discussed.

(Author)

#### A66-42556

THE LASER CURRENT TRANSFORMER FOR EHV POWER TRANSMISSION LINES.

S. Saito, Y. Fujii, K. Yokoyama, J. Hamasaki (Tokyo, University, Institute of Industrial Science, Tokyo, Japan), and Y. Ohno (Tokyo Electric Power Co., Inc., Tokyo, Japan).

(International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Aug. 1966, p. 255-259.

A current measuring device applicable to an extra-high voltage power transmission line higher than 500 kv is proposed with preliminary experimental results. It obtains the instantaneous magnetic field adjacent to a transmission wire by measuring the angle of Faraday rotation of a laser beam in a flint glass rod. The laser beam is transmitted and analyzed at a ground potential site, and in the energized part this device has neither insulated conductors nor active elements. An experimental laser current transformer yielded a sensitivity of 66 mv per 100 amp and good linearity. Various sources of error and modifications are discussed.

(Author)

#### A66-42557

FLUID FLOW MEASUREMENTS WITH A LASER DOPPLER VELOCIMETER.

J. W. Foreman, Jr., E. W. George, J. L. Jetton, R. D. Lewis, J. R. Thornton, and H. J. Watson (Brown Engineering Co., Inc., Research Laboratories, Huntsville, Ala.).

(International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Aug. 1966, p. 260-266. 9 refs.

Contracts No. NAS-20145; No. NAS-20073.

The basic principles of the laser Doppler velocimeter, a new instrument for measurement of localized flow velocities in gases and liquids, are discussed in detail. Velocity measurements are made by detecting the Doppler shift in monochromatic laser light which is scattered from small contaminant particles in the fluid. A CW gas laser serves as the light source, and the Doppler shift is detected by optical heterodyne techniques. The latest fluid flow measurements obtained with the laser Doppler velocimeter are presented.

(Author)

#### A66-42559

WIDE FIELD ACTIVE IMAGING.

R. A. Myers, H. Wieder, and R. V. Pole (International Business Machines Corp., Thomas J. Watson Research Center, Yorktown Heights, N. Y.).

(International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Aug. 1966, p. 270-275. 10 refs.

In the paper we report the results of some experiments in active imaging - image processing in which the pictorial information is placed within the laser cavity. By the use of an active medium which provides high gain over a wide aperture, in conjunction with a highly degenerate conjugate resonator, we have been able to obtain diffraction limited resolution with an information content orders of magnitude greater than previously reported. The resonator used is the Flat-Field Conjugate Resonator (FFCR), which can support as many as  $10^7$  modes of nearly equal Q when properly designed lenses are used. As active medium we used the pulsed hollow cathode  $\text{Hg}^+$  laser. In the present FFCR, two plane mirrors are imaged one upon the other by means of two achromatic doublets (focal lengths about 200 mm) located between the ends of the discharge tube and the mirrors. Active imaging is accomplished by masking one of the mirrors and observing the pattern resulting on the other mirror. Masks used include pinholes, wire meshes, and photographic transparencies as well as patterns etched in thin metallic films that were used directly as mirrors. With the doublets working near  $f/10$ , the resolution over a 15-mm-diam field was greater than 100 lines/mm, which corresponds quite well to the observed resolution of the passive system. The resonator was thus capable of actively imaging photographic transparencies having more than  $10^6$  bits. One characteristic of active imaging in this type of resonator is that all the modes have a large common active volume, and the suppression of some of the modes enhances the intensity of the others. Furthermore, the nonlinear behavior of a laser as an oscillator allows sharp discrimination between differing loss levels in the cavity. These effects have been observed, and their possible application to contrast enhancement and image dissection is discussed.

(Author)

#### A66-42560

PULSED LASER HOLOGRAMS.

R. E. Brooks, L. O. Heflinger, and R. F. Wuerker (TRW, Inc., TRW Systems Group, Redondo Beach, Calif.).

(International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Aug. 1966, p. 275-279. 12 refs.

The limited coherence of most pulsed lasers is the principal difficulty in making pulsed holograms. The paper describes techniques used for the production of quality holograms of back lighted subjects, using ordinary pulsed lasers. The arrangements used achieve a temporal and spatial matching of the scene and reference beams to the degree required by the laser coherence cell. Techniques are described which prevent the destruction of the spatial match when using a diffusing screen. The use of lenses to permit the recording of large subjects on small holograms with limited pulsed energy is described. The limitations on subject motion are described. Experimental examples of the techniques are illustrated by holographic recordings of bullets in flight. The technique of double exposure holographic interferometry is also illustrated.

(Author)

#### A66-42561

MEASUREMENTS OF GAIN PERPENDICULAR TO THE JUNCTION IN GALLIUM ARSENIDE LASER STRUCTURES.

T. S. Moss, G. J. Burrell, and A. Hetherington (Ministry of Aviation, Royal Aircraft Establishment, Farnborough, Hants., England).

(International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Aug. 1966, p. 279-282.

Gain measurements are reported for radiation of wavelength 8466 Å propagating in a direction perpendicular to the junction of a GaAs injection laser operated at 80°K. These results, used in conjunction with measurements of spontaneous emission, show that a gain of 2.3% is achieved at 7000 amp/cm<sup>2</sup>. In thermal equilibrium, neglecting free carrier absorption, 0.78% of the transmitted radiation is absorbed in traversing the active region, 135 amp/cm<sup>2</sup> being required to offset this loss. Allowance for free carrier absorption changes the above figures somewhat. The separation of the quasi-Fermi levels is also deduced from these data. (Author)

#### A66-42562

##### SEMICONDUCTOR LASER AMPLIFIER.

J. W. Crowe and W. E. Ahearn (International Business Machines Corp., Thomas J. Watson Research Center, Yorktown Heights, N.Y.). (International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)  
IEEE Journal of Quantum Electronics, vol. QE-2, Aug. 1966, p. 283-289.

Contract No. NAS 8-11663.

The infrared GaAs injection amplifiers described have gains as high as 2000 and give output powers of 150 mw when operating at 77°K and driven by a single mode. Output efficiencies of 68% differential and 50% overall can be obtained if the amplifier is driven by light of spectral width equal to the band-pass of the amplifier (30 Å). Regenerative effects are minimized by coating the diodes with three-fourth wavelength coatings of SiO. Thresholds at liquid nitrogen temperature were raised by a factor of ten on some diodes after the coatings were applied. Experimental data obtained on gain, efficiency, spectra, beamwidth, and noise power of several amplifiers are summarized and presented. (Author)

#### A66-42563

##### SINGLE TRANSVERSE AND LONGITUDINAL MODE Q-SWITCHED RUBY LASER.

V. Daneu, C. A. Sacchi, and O. Svelto (Milano, Politecnico, Istituto di Fisica, Milan, Italy). (International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)  
IEEE Journal of Quantum Electronics, vol. QE-2, Aug. 1966, p. 290-293. 13 refs.

Research supported by the Consiglio Nazionale delle Ricerche.

Single transverse and longitudinal modes have been observed in the output of a passive Q-switched ruby laser when two spherical mirrors are used for the resonator. This result has been consistently obtained with several rods, with two sets of mirrors of different radius of curvature, and with a few values of reflectivity of the mirrors which proves that it is typical of a spherical resonator. The saturable absorber is a solution of vanadium phthalocyanine in nitrobenzene. To have a single transverse mode, the mirror alignment and the position of the rod within the cavity is critical. When the laser oscillates in a single mode, the output pulse is very reproducible and the fluctuations of peak amplitude and width of the pulse are less than ~3%. Furthermore, as expected, the output beam has a very good spatial coherence and its divergence approaches the limits set by diffraction. As far as peak output power and width of the pulse, the best results have been obtained with one concave and one convex mirror of ~5-m radius of curvature, one mirror being 90% and the other 50% reflecting. A pulse of 1 Mw peak power and 30 nsec half-width has been obtained. (Author)

#### A66-42564

##### ALTERNATIVE INTERPRETATION OF ROTATION RATE SENSING BY RING LASER.

E. O. Schulz-Dubois (Bell Telephone Laboratories, Inc., Solid-State Devices Laboratory, Murray Hill, N.J.).  
IEEE Journal of Quantum Electronics, vol. QE-2, Aug. 1966, p. 299-305. 15 refs.

Description of the laser rotation rate sensor, sometimes also referred to as laser gyroscope, which was most extensively investigated by Macek et al. The function of rotation sensing is first discussed for a ring resonator of circular shape. It is seen that

in that case the standing wave electromagnetic energy distribution remains stationary while the cavity structure with an attached detector is rotated so that the detector samples standing waves. Thus, rotation sensing is linked with the fact that Maxwell's equations are valid for inertial reference frames or - equivalently - with the inertial nature of electromagnetic radiation. The concept of inertia is then used to derive the ring laser equation for arbitrary ring shape. These viewpoints are intended to offer a more elementary understanding of rotation sensing through ring lasers than other available derivations. M. F.

#### A66-42565

##### MODE COUPLING IN A RUBY LASER.

R. H. Pantell and R. L. Kohn (Stanford University, W. W. Hansen Laboratories of Physics, Microwave Laboratory, Stanford, Calif.).  
IEEE Journal of Quantum Electronics, vol. QE-2, Aug. 1966, p. 306-310. 12 refs.

Contract No. AF 33(657)-11042.

An analysis is performed for a pulsed ruby laser with a modulator internal to the interferometer resonator. The problem is a transient one, since steady state is not reached during the period of oscillation of the pulsed laser. The solution obtained is not a steady-state solution, but is applicable to the time interval of interest for the ruby laser. It is found that the electric field envelope is composed of frequency components which are multiples of both the modulation frequency and the free-running beat frequency. A comparison is made between the theory and experimental data obtained from loss modulation of a ruby laser. (Author)

#### A66-42566

##### CHARACTERISTICS OF A SINGLE-FREQUENCY MICHELSON-TYPE He-Ne GAS LASER.

M. DiDomenico, Jr. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).  
IEEE Journal of Quantum Electronics, vol. QE-2, Aug. 1966, p. 311-322. 16 refs.

A new mode suppression configuration is described for producing a single-frequency output from gaseous lasers. This configuration has the form of a modified Michelson interferometer where the basic modification is in the introduction of a third feed-back mirror for coupling the two branches of the Michelson. Small path length differences between the two branches of the Michelson are responsible for the mode suppression properties of the device which come about through interference phenomena at the beam splitter. This results in a frequency-dependent power loss out of the beam splitter which can provide for large amounts of mode discrimination. The device is made into an oscillator by introducing gain into each of the two branches of the Michelson. A detailed analysis of the device is given based on the scattering matrix formalism. The results of the analysis give the oscillation frequencies, the degree of mode discrimination, the internal laser radiation intensity, and equations for the output power. Experimentally, a 10 mw single-mode 6328 Å He-Ne Michelson-type gas laser is described. Data on the frequency spectrum, output power, and amplitude stability of a free running laser are given and correlated with theory. While it is shown that single-frequency operation is easily obtained, the device in its present form does not include a means for stabilizing the frequency. (Author)

#### A66-42569

##### GAS PUMPING IN REPETITIVELY PULSED ION LASERS.

R. H. Neusel (TRW, Inc., TRW Systems Group, Redondo Beach, Calif.).  
IEEE Journal of Quantum Electronics, vol. QE-2, Aug. 1966, p. 331-333.

Discussion of the axial pressure differential that is established in repetitively pulsed ion lasers and the effect on the laser output. It is found that the performance of such lasers can be generally improved if the laser tube has a gas bypass connecting the anode to the cathode structures. Values representing the percentage increase in the average intensity for a number of laser oscillations with the gas bypass valve opened are given. B. B.

**A66-42570****NARROW SPECTRUM GIANT PULSE LASER.**

L. M. Frantz and R. S. Witte (TRW, Inc., TRW Systems Group, Redondo Beach, Calif.).

IEEE Journal of Quantum Electronics, vol. QE-2, Aug. 1966, p. 333, 334. 5 refs.

Outline of an alternative scheme for producing narrow spectral outputs from actively Q-switched lasers. A theoretical expression is derived for the fraction of total emitted energy contained in the desired (injected) mode group during the buildup of the giant pulse, the fraction being essentially independent of time. It is assumed that no mode coupling effects are present in this derivation and that no serious error is introduced by ignoring the time-dependent spatial distribution of excited-state atoms and photon energy. These results lead to a predicted output having 99% of its energy in the injected mode group.

B. B.

**A66-42636****MULTIPLE ACOUSTIC DIFFRACTION TECHNIQUES FOR FREQUENCY SHIFTING OF LASER SOURCES.**

C. S. Tsai (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Research Laboratories, Palo Alto, San Jose State College, San Jose, Calif.) and B. A. Auld (Stanford University, W. W. Hansen Laboratories of Physics, Microwave Laboratory, Stanford, Calif.).

IEEE, Proceedings, vol. 54, Sept. 1966, p. 1217, 1218. 5 refs. Contract No. AF 49(638)-1429.

Description of two possible configurations for the realization of multiple laser light scattering using microwave acoustic waves. It is known that large amounts of frequency shift can be achieved by using multiple diffraction to shift laser frequency by integer multiples of the acoustic wave frequency. Configurations are described in which two Porro prisms are arranged so as to trap the scattered optical beams and pass them repeatedly through the acoustic column. An expression for the sideband intensities is derived. An alternative configuration is described in which a pair of overlapping optical cavities with their axes tilted by twice the first-order Bragg angle are used.

M. L.

**A66-42727****CHANGE OF LIGHT-PULSE SHAPE BY NONLINEAR AMPLIFICATION.**

N. G. Basov and V. S. Letokhov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(Akademiia Nauk SSSR, Doklady, vol. 167, Mar. 1, 1966, p. 73-76.)

Soviet Physics - Doklady, vol. 11, Sept. 1966, p. 222-224. 13 refs. Translation.

[For abstract see issue 14, page 2307, Accession no. A66-27183]

**A66-42729****FAST LIQUID SHUTTER FOR Q-MODULATION OF A NEODYMIUM GLASS LASER.**

M. P. Vaniukov, O. D. Dmitrievskii, V. I. Isaenko, and V. A. Serebriakov.

(Akademiia Nauk SSSR, Doklady, vol. 167, Mar. 21, 1966, p. 547, 548.)

Soviet Physics - Doklady, vol. 11, Sept. 1966, p. 233, 234. 6 refs. Translation.

[For abstract see issue 14, page 2308, Accession no. A66-27595]

**A66-42753 #****EXCITATION OF SIGNALS IN A NEGATIVELY CHARGED ANTENNA ROD IN THE EFFECT OF AN UNFOCUSED LASER BEAM [O VOZBUZHDENII SIGNALOV V OTRITSATEL'NO ZARIAZHENNOM SHTYRE ANTENNY PRI VOZDEISTVII NEFOKUSIROVANNOGO LAZERNOGO LUCHA].**

G. A. Askar'ian, M. S. Rabinovich, A. D. Smirnova, V. K. Stepanov, and V. B. Studenov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

ZHETF Pis'ma v Redaktsiiu, vol. 4, Sept. 1, 1966, p. 177-180. In Russian.

Investigation of current pulses originating when an unfocused laser beam falls on a metal electrode or rod serving as an antenna. A conventional ruby laser with a modulated Q factor whose beam was directed at a rod antenna under a negative voltage, at a distance of several meters. The current pulses observed when this is done are probably due to the current originating when the electrons are moved away from the rod by the radiation from the laser. When the gas pressure around the antenna is thus reduced, the mobility of the electrons increases, and the voltage required to move the electrons from the antenna can be low.

W. A. E.

**A66-42754 #****COHERENT AMPLIFICATION OF RF RADIATION IN A SPACE MEDIUM [KOGHERENTNOE USILENIE RADIOIZLUCHENIIA V KOSMICHESKOI SREDE].**

D. A. Varshalovich (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR).

ZHETF Pis'ma v Redaktsiiu, vol. 4, Sept. 1, 1966, p. 180-182. In Russian.

Consideration of the possibility of coherent amplification of radio-frequency radiation as a significant factor in cosmic space. It is assumed that the energy level population is entirely determined by the reaction of atoms with radiation and that collisions play no part in it. In interstellar space these conditions occur, as it has no thermodynamic equilibrium, its density is negligible, and the radiation flux from the nearest stars is quite intense. Therefore, natural masers may exist in space and may act as amplifiers for rf radiation.

W. A. E.

**A66-42755 #****GIANT PULSES OF SUPERLUMINESCENCE [GIGANTSKIE IMPUL'SY SVERKHLUMINESTSENTSII].**

V. S. Zuev, V. S. Letokhov, and Iu. V. Senatskii (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

ZHETF Pis'ma v Redaktsiiu, vol. 4, Sept. 1, 1966, p. 182-185. In Russian.

Analysis of the radiation of giant pulses of luminescence by a highly excited active medium of neodymium glass with rapid cutin of amplification. These phenomena may be of interest for investigating nonlinear optics, studying the mechanism of damage to transparent materials by a strong light field, etc. Maximum amplification of the active medium is limited by self-excitation of the pumped glass rods due to Fresnel reflection of light. The pulses of superluminescence obtained have a power of up to 500 mw/cm<sup>2</sup>. After several intensive flashes, the output end of the rod failed, indicating that the self-damage of neodymium glass under the effect of intense noncoherent radiation is possible.

W. A. E.

**A66-42799****CRYSTALLINE SOLID LASERS.**

Z. J. Kiss and R. J. Pressley (Radio Corporation of America, RCA Laboratories, Princeton, N.J.).

Applied Optics, vol. 5, Oct. 1966, p. 1474-1486. 94 refs.

Survey of crystalline solid lasers is presented. Crystalline host materials are described, pointing out their characteristics pertinent for laser systems. Rare earth and transition metal impurities operated as lasers are tabulated, and the role of sensitization in increasing the overall efficiency of laser systems is described. Characteristics of operating CW lasers are given, and some applications and research directions are suggested.

(Author)

**A66-42800****GLASS LASERS.**

E. Snitzer (American Optical Co., Southbridge, Mass.).

Applied Optics, vol. 5, Oct. 1966, p. 1487-1499. 80 refs.

General discussion of the merits of glass vs crystals as host materials for laser ions and a summary of the various glass lasers. Because of its importance as an efficient, room-temperature laser the properties of neodymium are considered in greater detail. This includes the nonlaser properties of Nd<sup>3+</sup> in glass, the spectral and temporal emission characteristics of Nd<sup>3+</sup> lasers, and Nd<sup>3+</sup> laser configurations. Separate sections deal with the other

two room temperature lasers which use  $\text{Yb}^{3+}$  or  $\text{Er}^{3+}$ . The problem of thermal stability of laser cavities is also discussed. Finally, a survey is given of the glasses that are useful as Faraday rotators. (Author)

#### A66-42801 GAS LASERS.

A. L. Bloom (Spectra-Physics, Inc., Mountain View, Calif.).  
Applied Optics, vol. 5, Oct. 1966, p. 1500-1514. 72 refs.

Review of the present status of gas-discharge lasers, with particular attention to developments reported in 1965 and early 1966. Gas lasers are classified by types (neutral atom, ion, and molecular), and a comparison is given of the properties of the various types. A short discussion is given of noise and coherence properties. Detailed descriptions are given of three recent developments of particular interest - the  $\text{CO}_2$  laser, the argon-ion laser, and pulsed self-terminating lasers. Finally, brief mention is made of the most important present applications of gas lasers. (Author)

#### A66-42802 SEMICONDUCTOR LASERS.

Marshall I. Nathan (International Business Machines Corp., Thomas J. Watson Research Center, Yorktown Heights, N.Y.).  
Applied Optics, vol. 5, Oct. 1966, p. 1514-1528. 132 refs.

Review of current semiconductor laser technology. Operating principles unique to semiconductor lasers are the continuous spectrum of the electronic states and the variety of pumping schemes (injection via the p-n junction, electron beam pumping, optical pumping, and avalanche breakdown). A p-n junction laser is compact and simple, requiring only a low dc voltage power supply, but p-n junctions are often difficult or impossible to make; the other three pumping methods eliminate this problem. A table of semiconductor laser materials is provided, and some of the properties of various materials are discussed. Gallium-arsenide junction lasers are considered in more detail, with respect to junction fabrication, threshold current density and temperature-dependence, operating characteristics, modulation, and applications. They are the most common type of p-n junction lasers, although considerable work has now been done on p-n junction lasers utilizing materials other than GaAs. W.A.E.

#### A66-42803 PRESSURE SHIFTS IN A STABILIZED SINGLE WAVELENGTH HELIUM-NEON LASER.

A. L. Bloom and D. L. Wright (Spectra-Physics, Inc., Mountain View, Calif.).  
Applied Optics, vol. 5, Oct. 1966, p. 1528-1532. 8 refs.

Frequency shifts of a  $6328 \text{ \AA}$  single-frequency laser stabilized on the Lamp dip have been measured as a function of total helium-neon pressure and for several gas mixtures. The total shift in the pressure region between 2 and 4 torr is about 40 MHz, with a constant region between 2 and 2.5 torr. A simplified theoretical treatment is given, based on collision-broadened phase shifts and line widths determined in other laser experiments. It is shown that the variations in these parameters with pressure form the basis of an adequate prediction of the observed pressure shifts. (Author)

#### A66-42804 COMPUTER APPLICATIONS OF LASERS.

William V. Smith (International Business Machines Corp., Thomas J. Watson Research Center, Yorktown Heights, N.Y.).  
Applied Optics, vol. 5, Oct. 1966, p. 1533-1538. 11 refs.

Qualitative analysis of the applicability of lasers to the logic, memory, input-output, and data transmission-linkages parts of computers. The more promising potential applications are considered to lie in memory, interconnection, and input-output, and the least promising in fast logic. Coherent optical data-preprocessing is cited as an example of an already clearly useful laser application. (Author)

#### A66-42805

##### OPTICAL TRANSMISSION RESEARCH.

S. E. Miller and L. C. Tillotson (Bell Telephone Laboratories, Inc., Crawford Hill Laboratory, Holmdel, N.J.).  
Applied Optics, vol. 5, Oct. 1966, p. 1538-1549. 59 refs.

Survey of current research efforts in optical communications systems, which have been stimulated by the availability of coherent sources producing usable amounts of power in the optical frequency range. Devices such as oscillators, modulators, detectors, and ancillary apparatus having desirable characteristics are available and are being used to design and build prototype terminals. Media being studied with a view toward improving optical communications systems include transmission through the atmosphere and enclosed media with appropriate focusing and directing elements. Experimental optical systems have exceptionally broad bands on one carrier and exceptionally well confined transmission beams. Their long-distance transmission reliability, however, is still not adequately advanced, and optical repeater components are not yet competitive with their lower-frequency counterparts. Some of their characteristic features are discussed, and the current technical level of major components is reviewed. W.A.E.

#### A66-42806

##### LASER BEAMS AND RESONATORS.

H. Kogelnik (Bell Telephone Laboratories, Inc., Murray Hill, N.J.) and T. Li (Bell Telephone Laboratories, Inc., Holmdel, N.J.).  
Applied Optics, vol. 5, Oct. 1966, p. 1550-1567. 44 refs.

Review of the theory of laser beams and resonators. Coherent radiation generated by a laser usually appears as a beam whose transverse extent is large compared to its wavelength. The resonant properties of such a beam in the resonator structure, its propagation characteristics in free space, and its interaction with various optical elements and devices have been studied extensively in recent years, and various theories have been developed to explain them. The merits of these theories are considered. The passage of paraxial rays through optical structures is analyzed first by working from the standpoint of geometrical optics. Laser beams and resonators are then analyzed, with consideration of the wave nature of the beams but neglecting diffraction effects due to the finite size of the apertures. Finally resonator modes are discussed, with consideration of aperture diffraction effects. W.A.E.

#### A66-42809

##### THE ANTENNA PROPERTIES OF OPTICAL HETERODYNE RECEIVERS.

A. E. Siegman (Stanford University, Dept. of Electrical Engineering, Stanford, Calif.).  
Applied Optics, vol. 5, Oct. 1966, p. 1588-1594. 19 refs.  
Contract No. DA-28-043-AMC-00446(E).

Consideration of optical heterodyne receivers, viewed as both receivers and antennas. As antennas, they are characterized by the effective aperture of capture cross section presented to a signal plane wave arriving from any specified direction. There is an unavoidable inverse tradeoff between the directional tolerance or angular field of view of an optical heterodyne receiver and its effective aperture or capture area. Their product is limited by the square of the signal wavelength  $\lambda^2$ . Optical heterodynes are very insensitive detectors of thermal radiation, if not wholly useless for this purpose. However, they can be useful for detecting Doppler shifts in coherent light scattered by liquids, gases, or small particles. The wavefront alignment between signal and local-oscillator beams required for effective optical heterodyning can be summarized in an "antenna theorem," where the moments of the quantum efficiency are evaluated over the photosensitive surface. W.A.E.

#### A66-42810

##### NONLINEAR OPTICS.

R. W. Minck, R. W. Terhune, and C. C. Wang (Ford Motor Co., Scientific Laboratory, Dearborn, Mich.).  
Applied Optics, vol. 5, Oct. 1966, p. 1595-1612. 106 refs.



## A66-42811

Review of recent advances in the field of nonlinear optical phenomena, with particular emphasis on such topics as parametric oscillation, self-focusing and trapping of laser beams, and stimulated Raman, Rayleigh, and Brillouin scattering. The optical-frequency radiation is treated classically in terms of the amplitudes and phases of the electromagnetic fields. The interactions of light waves in a material are then formulated in terms of Maxwell's equations and the electric dipole approximation. In this method, nonlinear susceptibility tensors are introduced which relate the induced dipole moment to a power series expansion in field strengths. The tensor nature and the frequency-dependence of the nonlinearity coefficients are considered. The various experimental observations are described and interpreted in terms of this formalism. (Author)

## A66-42811

### ELECTROOPTIC LIGHT MODULATORS.

I. P. Kaminow and E. H. Turner (Bell Telephone Laboratories, Inc., Crawford Hill Laboratory, Holmdel, N.J.).

Applied Optics, vol. 5, Oct. 1966, p. 1612-1628. 125 refs.

Summary of the field of electrooptic light modulation by means of the Pockels and Kerr effects in crystals, with particular attention to communications applications using the optical maser. All available data on electrooptic materials are tabulated, and design considerations and operating principles for various modulator configurations are outlined. (Author)

## A66-42813

### STABILIZATION AND MODULATION OF LASER OSCILLATORS BY INTERNAL TIME-VARYING PERTURBATION.

S. E. Harris (Stanford University, Dept. of Electrical Engineering, Stanford, Calif.).

Applied Optics, vol. 5, Oct. 1966, p. 1639-1651. 31 refs. Grant No. NGR-05-020-103.

Review of the application of internal time-varying perturbation to the problem of laser mode control and stabilization. The spectral characteristics and time domain behavior obtained by means of phase and loss perturbations are considered. Two techniques which allow the attainment of high single-frequency output powers from normally multimode lasers are described. A method for the absolute frequency stabilization of an FM laser is considered, and a brief discussion of an efficient method of internal modulation, termed coupling modulation, is given. (Author)

## A66-42816

### A TELEVISION DISPLAY USING ACOUSTIC DEFLECTION AND MODULATION OF COHERENT LIGHT.

A. Korpel, R. Adler, P. Desmares, and W. Watson (Zenith Radio Corp., Chicago, Ill.).

Applied Optics, vol. 5, Oct. 1966, p. 1667-1675. 10 refs.

Description of the horizontal deflection in a TV display produced by Bragg reflection of laser light by ultrasonic waves in water. The ultrasonic waves are frequency-modulated with a sawtooth function. Deflection angles are small, but there are 200 resolvable positions. The constant rate of angular change characteristic of a TV scan permits the use of a wide optical aperture, thus providing a small spot size. Conventional optical magnification follows the horizontal deflection, rendering a 3-Mc video signal visible on the screen. The tolerance on the orientation of the acoustic wavefronts, the improvement brought about by the phased array, and the amount of power needed to drive the diffraction cell are calculated, and the results confirmed by measurement. There is good agreement between the experimentally observed optical resolution (spatial frequency response) and the theoretical expectation based on the computed far-field intensity pattern. W. A. E.

## A66-42817

### A SURVEY OF LASER BEAM DEFLECTION TECHNIQUES.

V. J. Fowler and J. Schlafer (General Telephone and Electronics Laboratories, Inc., Bayside Laboratory, Bayside, N.Y.).

Applied Optics, vol. 5, Oct. 1966, p. 1675-1682. 40 refs.

Review of methods of high-resolution, high-speed, optical-beam deflection and scanning with respect to resolution and scanning frequency capabilities. A general description is given of external deflector devices in the categories of variable reflectors, variable refractors, birefringent deflectors, and interference deflectors. The different techniques are then evaluated on the basis of their application to high-speed, high-resolution, precision scanning applications. (Author)

## A66-42820

### THE MEASUREMENT OF FAST CURRENT PULSES IN THE KILOAMPERE RANGE.

John P. Markiewicz and John L. Emmett (Stanford University, Dept. of Physics, Stanford, Calif.).

Applied Optics, vol. 5, Oct. 1966, p. 1687, 1688. NASA-supported research.

Description of a current transducer for measuring fast current pulses in the kiloampere range. Measurement or monitoring of the current pulse discharged through a lamp is often important when pulsed light sources are being used in such areas as laser research. The current transducer described provides a satisfactory means of doing this and eliminates the shortcomings of series resistors and Rogovsky coils. W. A. E.

## A66-42977

### EFFECT OF A LONGITUDINAL MAGNETIC FIELD ON RADIATED POWER OF A HELIUM-NEON LASER AT 1.15 $\mu$ .

A. E. Fotiadi and S. A. Fridrikhov (Leningradskii Politehnicheskii Institut, Leningrad, USSR).

(Zhurnal Tekhnicheskoi Fiziki, vol. 36, Mar. 1966, p. 560-563.) Soviet Physics - Technical Physics, vol. 11, Sept. 1966, p. 416-418. 8 refs. Translation.

[For abstract see issue 14, page 2307, Accession no. A66-27156]

## A66-42993

### DOUBLE FOCUSING IN A HYDROGEN MASER [DOUBLE FOCALISATION DANS UN MASER A HYDROGENE].

Jean-Pierre Schermann (Paris, Université, Institut d'Electronique Fondamentale, Orsay, Seine-et-Oise, France).

Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques, vol. 263, no. 4, July 25, 1966, p. 295-298. 5 refs. In French.

Demonstration that the phenomenon of very fine-beamed maser oscillation (produced in atomic hydrogen by a hf discharge), which according to Ramsey's theory is extinguished due to the spin-exchange effect, can nevertheless be observed by a double focusing technique. The ideal conditions under which maser oscillation occurs, in the absence of spin-exchange, are defined. The mechanism of spin-exchange, as developed by Ramsey, is described, and its effect in extinguishing maser oscillation from atomic hydrogen passed through an inhomogeneous hexapolar magnetic field is considered. The double-focus technique results in greatly attenuating the dampening effect of spin-exchange on such induced maser oscillation. D. P. F.

## A66-42998

### STUDY OF THE OPTICAL TRANSMISSION OF A PLASMA PRODUCED BY THE "EXPLOSION" OF A PREVIOUSLY IONIZED GASEOUS FILAMENT [ETUDE DE LA TRANSMISSION OPTIQUE DU PLASMA PRODUIT PAR L' "EXPLOSION" D'UN FILAMENT GAZEUX PREIONISE].

François Cabannes, Maurice Skowronek, and Alain Goldstein (Centre National de la Recherche Scientifique, Laboratoire des Echanges Thermiques, Bellevue, Seine-et-Oise, France).

Académie des Sciences (Paris), Comptes Rendus, Série B - Science Physiques, vol. 263, no. 5, Aug. 1, 1966, p. 360-363. 9 refs. In French.

Description of the experimental determination of the optical characteristics of a very dense and easily reproducible plasma

generated by the explosion of a previously ionized thin column of gas, using a laser beam. Measurement of the light spectrum indicates that the luminosity attains its maximum within 1.5  $\mu$ sec after the commencement of the electrical discharge, which explodes the column of gas. The light temperature exceeds  $5 \times 10^4$  °K. The optical density of the plasma column was measured in order to ascertain whether this temperature was representative of the plasma temperature. A ruby laser, triggered by a Kerr cell, was used as a source of light for this measurement; the laser pulse was synchronized with the discharge generating the plasma. An analysis of the results obtained indicate an electron density of  $10^{20}/\text{cm}^3$ .

D. P. F.

**A66-42999**

RELAXATION EMISSION OF A RUBY LASER WITH A VIBRATING MIRROR [EMISSION RELAXEE D'UN LASER A RUBIS A MIROIR VIBRANT].

Germain Chartier, Suzanne Biraud, and Alain Koster (Paris, Université, Institut d'Electronique Fondamentale, Orsay, Seine-et-Oise, France).

Académie des Sciences (Paris), *Comptes Rendus, Série B - Sciences Physiques*, vol. 263, no. 5, Aug. 1, 1966, p. 376-379. In French.

Investigation of the effects on a ruby laser system caused by making one of the mirrors constituting the resonant cavity vibrate at a frequency of 1 Mc and at an amplitude attaining 0.25  $\mu$ . It is shown that the perturbing effect on the system caused by the vibrating mirror can be at least partially accounted for by modulating the term which expresses cavity losses by a factor of 5% in the equations which describe the functioning of a solid relaxation laser. D. P. F.

**A66-43006**

EFFECT OF LASER OSCILLATIONS ON THE CHARACTERISTICS OF THE ELECTRON GAS OF A HELIUM-NEON LASER PLASMA [INFLUENCE DE L'OSCILLATION LASER SUR LES CARACTERISTIQUES DE LAZ D'ELECTRONS DU PLASMA D'UN LASER A HELIUM-NEON].

Christian Vauge and Jean-François Delpech (Paris, Université, Institut d'Electronique Fondamentale, Orsay, Seine-et-Oise, France).

Académie des Sciences (Paris), *Comptes Rendus, Série B - Sciences Physiques*, vol. 263, no. 6, Aug. 8, 1966, p. 443-445. In French.

Experimental study of the effect of laser oscillations on the characteristics of the electron gas formed by the plasma of an He-Ne laser oscillating on the  $3s_2-3p_4$  neon transition. This effect is observed by studying the variations in the attenuation of a waveguide containing a plasma in which a wave of low power serving as a probe is propagating. The wave attenuation due to the plasma is determined, as well as the relative variation in the product of the electron collision frequency times the electron density attributable to laser oscillations.

A. B. K.

**A66-43007**

EFFECT OF ENTRAINING THE ACTIVE MEDIUM OF AN ANNULAR GAS LASER [EFFET DE L'ENTRAÎNEMENT DU MILIEU ACTIF D'UN LASER A GAZ EN ANNEAU].

Edmond Batifol and Dario Pécile (Centre National d'Etudes des Telecommunications, Issy-les-Moulineaux, Seine, France).

Académie des Sciences (Paris), *Comptes Rendus, Série B - Sciences Physiques*, vol. 263, no. 6, Aug. 8, 1966, p. 446-449. In French.

Study of the beating of oscillating frequencies corresponding to the two directions of travel of an annular cavity laser when the gaseous discharge column constituting the active medium is in movement. The results of the study are said to provide a method of shifting the zero of a laser gyroscope without having to introduce solid elements into the interior of the cavity.

A. B. K.

**A66-43022**

LASER RADAR PROBE FOR THE MEASUREMENT OF METASTABLE NITRIC OXIDE IN THE UPPER ATMOSPHERE.

L. J. Nugent (Electro-Optical Systems, Inc., Pasadena, Calif.). *Nature*, vol. 211, Sept. 24, 1966, p. 1349-1351. 14 refs.

Study of the possibility of detecting the concentration of nitric oxide in metastable  $a^4\Pi_1$  state in the atmosphere by using specially selected giant-pulse Raman laser sources. It is believed that absorption and resonance emission in the Ogawa bands provide the mechanism by which these metastable state populations could be investigated in the upper atmosphere by means of the laser radar technique. The sensitivity of a metastable state  $\text{NO}^*$  optical radar probe using a giant-pulse Raman laser is examined, and estimates of the minimum detectable  $\text{NO}^*$  concentrations are made as a function of altitude and sky radiation background conditions. It is concluded that the proposed technique is feasible under certain background conditions and that it should provide the means of obtaining new information about metastable state nitric oxide in the upper atmosphere.

A. B. K.

**A66-43034**

SPECTROSCOPIC AND LASER PROPERTIES OF EUROPIUM  $\alpha$ -NAPHTHOYLTRIFLUOROACETONATE IN SOLUTION.

E. P. Riedel and R. G. Charles (Westinghouse Electric Corp., Atomic, Defense and Space Group, Research and Development Center, Research Laboratories, Pittsburgh, Pa.).

*Journal of Chemical Physics*, vol. 45, Sept. 15, 1966, p. 1908-1914. 31 refs.

Contract No. Nonr-5033(00).

Ultraviolet radiation absorbed by the organic ligands surrounding the europium ion in europium  $\alpha$ -naphthoyltrifluoroacetate  $\text{Eu}(\alpha\text{-NTF})_3$  is efficiently converted via intramolecular energy transfer to fluorescence characteristic of  $\text{Eu}^{3+}$ . The quantum efficiency for this process is shown to be a constant from 2600 to 3900 Å in acetonitrile solution. Laser operation has been observed at temperatures up to -10°C. The effect of the relatively high scattering losses on both the threshold and the radiance of the laser are discussed.

(Author)

**A66-43039**

EVIDENCE FOR QUENCHING OF STIMULATED RAMAN SCATTERING OF 5289-Å LASER RADIATION BY TWO-PHOTON ABSORPTION IN ORGANIC LIQUIDS.

J. A. Duardo and F. M. Johnson (Electro-Optical Systems, Inc., Pasadena, Calif.).

*Journal of Chemical Physics*, vol. 45, Sept. 15, 1966, p. 2325, 2326. 17 refs.

USAF-supported research.

Indication that when the frequency of intense incident radiation is approximately half the frequency of an allowed electronic transition of a molecule, two-photon absorption may come into play to such an extent that it completely quenches the stimulated Raman scattering (SRS) process. Experimental observations which are interpreted in terms of this type of quenching mechanism are briefly described.

F. R. L.

**A66-43042**

MASER MODEL FOR INTERSTELLAR OH MICROWAVE EMISSION.

M. M. Litvak, A. L. McWhorter, M. L. Meeks, and H. J. Zeiger (Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.).

*Physical Review Letters*, vol. 17, Oct. 10, 1966, p. 821-826. 18 refs.

Discussion of a maser amplifier model based on UV continuum pumping from nearby stars that seems able to explain recent observations of 18-cm OH emission from the direction of certain H II regions that have shown remarkable anomalies. It is found that sufficient gain is obtained only by taking into account the selective absorption of the UV radiation as it penetrates into the OH cloud, a process leading to the weakening of the major anti-inverting UV transitions.

B. B.

**A66-43044 #**  
**THE LASER AS AN OPERATIONAL METEOROLOGICAL TOOL.**  
 J. E. Masterson, J. L. Karney, and W. E. Hoehne (U.S. Navy, Pacific Missile Range, Environmental Sciences Div., Point Mugu, Calif.).  
American Meteorological Society, Bulletin, vol. 47, Sept. 1966, p. 695-701. 14 refs.

Description of a laser system used to obtain meteorological data that uses an oscilloscope to display the return signal. It is claimed that the return signal can be translated into quantitative data on the range and relative optical density of appreciable concentrations of particulate matter or aerosols in the path of the laser beam. It is said that an operational system will have a digital output that will be recorded with standard equipment on magnetic tape, for example, and that such other parameters as the direction of the laser beam and the time of the observation will be recorded with the return signal. B.B.

**A66-43055**  
**INVESTIGATION OF THE MAGNETIC FIELD OF A SPARK PRODUCED BY FOCUSING LASER RADIATION.**  
 V. V. Korobkin and R. V. Serov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).  
 (ZHETF Pis'ma v Redaktsiiu, vol. 4, Aug. 1, 1966, p. 103-106.)  
 JETP Letters, vol. 4, Aug. 1, 1966, p. 70-72. 7 refs. Translation.

Investigation of the magnetic field of a spark which exists only during the time when the plasma is fed by a laser beam, using a Q-switched ruby laser. The results are summarized as follows: a magnetic dipole moment exists in the spark. This moment is perpendicular to the laser-beam propagation direction. In addition, the direction of the moment depends essentially on the part of the lens through which the beam passes. Similar results are obtained when part of the beam passing through the center of the lens is obstructed. M.M.

**A66-43084**  
**RADIATION FLUCTUATIONS IN A GAS LASER.**  
 Iu. I. Zaitsev (Gor'kovskii Gosudarstvennyi Universitet, Radio-fizicheskii Institut, Gorki, USSR).  
 (Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 50, Mar. 1966, p. 525-533.)  
 Soviet Physics - JETP, vol. 23, Sept. 1966, p. 349-354. 16 refs. Translation.  
 [For abstract see issue 14, page 2307, Accession no. A66-27186]

**A66-43085**  
**SEMICONDUCTOR QUANTUM GENERATOR WITH TWO-PHOTON OPTICAL EXCITATION.**  
 N. G. Basov, A. Z. Grasiuk, I. G. Zubarev, V. A. Katulin, and O. N. Krokhin (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).  
 (Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 50, Mar. 1966, p. 551-559.)  
 Soviet Physics - JETP, vol. 23, Sept. 1966, p. 366-371. 11 refs. Translation.  
 [For abstract see issue 14, page 2307, Accession no. A66-27187]

**A66-43196**  
**MAKING FLOWS VISIBLE.**  
 Wolfgang F. Merzkirch (Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung, Ernst-Mach-Institut, Freiburg im Breisgau, West Germany).  
International Science and Technology, Oct. 1966, p. 46-48, 51-56.  
 Description of techniques for making compressible and incompressible flows visible. In incompressible flows, an additive is put into the stream and its movement is photographed. In compressible flows optical methods sensitive to density variations are employed. Sometimes, the strategy used for incompressible flows can be

adopted for compressible flows, and vice versa. Among the techniques indicated are methods involving the shadowgraph, schlieren systems, the Mach-Zehnder interferometer, and holographic interferometry with lasers. Photographs illustrate the use of the different techniques. M.F.

**A66-43226**  
**LASERS IN COMMUNICATIONS SYSTEMS [LAZERY V SISTEMAKH SVIAZI].**  
 V. N. Chernyshev, A. G. Sheremet'ev, and V. V. Kobzev.  
 Moscow, Izdatel'stvo Sviaz', 1966. 320 p. In Russian.

This book is the first Soviet attempt to consolidate the discussion of current technology in the practical application of lasers in radio communications systems, which is still a very new scientific and engineering discipline. The high degree of directivity and low power required for communications reliability when using visible and infrared waves as the carrier makes their application promising, although problems in the use of this range of electromagnetic radiation have not yet gone beyond the framework of theoretical and experimental investigation. A general analysis of the operating principles and circuit diagrams of laser devices is followed by a study of the propagation of visible and infrared radiation through materials and through the atmosphere. Methods of modulating coherent radiation and receiving optical oscillations are considered, and finally radio communications systems using laser devices are discussed. Appendices include lists of solid, gaseous, and liquid substances used in lasers, and a discussion of the theory of statistical reception in the optical range. W.A.E.

## 1967 IAA ENTRIES

**A67-10003 \***  
**LOW-LEVEL MICROWAVE MIXING IN RUBY.**  
 Walter H. Higa (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.).  
IEEE, Proceedings, vol. 54, Oct. 1966, p. 1453.  
 Demonstration of microwave mixing in a paramagnetic crystal using a traveling-wave maser (TWM). No internal modifications were made to the TWM, and a small segment of ruby at the input end of the TWM served as the mixer element. It is shown that the results obtained at the X-band were also obtained at the K-band. The four energy levels in ruby allowed the K-band experiment to be performed simply by changing the pumping frequency. The ruby was operated in the 90° orientation at a magnetic field of about 2400 gauss. M.M.

**A67-10009**  
**OBSERVATION OF SATURABLE FILTER ACTION IN A  $\text{UO}_2^{++}$ -DOPED GLASS.**  
 L. A. Cross (Michigan, University, Dept. of Chemistry, Ann Arbor, Mich.) and L. G. Cross (Lear-Siegler, Inc., Instrument Div., Laser Systems Center, Ann Arbor, Mich.).  
IEEE, Proceedings, vol. 54, Oct. 1966, p. 1460, 1461. 5 refs. Contract No. Nonr-4125(00).

Description of the properties of uranyl ( $\text{UO}_2^{++}$ )-doped glass for application as a saturable optical filter for use with lasers. Unlike other saturable filters currently employed, the initial level of the saturable absorption is itself an excited state, so that optical

pumping of an uranyl glass is required, the pumping bands lying in the region from 3700 to 5000 Å. Three different oscillators have been constructed using  $\text{UO}_2^{++}$ -doped glass as both a Q-switching element and as an element to quench the superradiance losses of the ruby.

M. M.

**A67-10012****DISCHARGE DYNAMICS IN THE LARGE DIAMETER MAGNETICALLY CONFINED ION GAS LASER.**

S. A. Ahmed and T. J. Faith, Jr. (Radio Corporation of America, Defense Electronic Products, Astro-Electronics Div., David Sarnoff Research Center, Princeton, N.J.).

IEEE, Proceedings, vol. 54, Oct. 1966, p. 1470, 1471.

Contract No. DA-28-043-AMC-01376(E).

Note on a study of magnetically confined high-current discharges for the purpose of obtaining higher-efficiency argon lasers. Experiments were carried out on a dc magnetically confined argon laser discharge in an 8-mm bore, 40-cm-long quartz tube situated in a 1500-gauss axial magnetic field. Results show that at high currents ion-drift effects cause the gas pumpout to reverse from pumping toward the anode to pumping toward the cathode. This causes the pressure to drop considerably along the tube toward the anode section, with important consequences for laser operation.

S. Z.

**A67-10013****224 MC/S OPTICAL PULSE CODE MODULATOR.**

R. T. Denton, T. S. Kinsel, and F. S. Chen (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

IEEE, Proceedings, vol. 54, Oct. 1966, p. 1472, 1473. 6 refs.

Description of an optical modulator for PCM transmission systems operating at a 224-Mc bit rate. The modulator uses the electrooptic effect in lithium tantalate and requires less than 10 mw drive power to a transistor pulse amplifier which supplies the drive voltage for the lithium tantalate. It acts as a gate for the regular train of optical pulses from a laser phase-locked at 224 Mc.

S. Z.

**A67-10020****MEASUREMENT OF OPTICAL SURFACE ROUGHNESS USING COHERENT RADIATION.**

S. Karp, R. B. Hankin, S. Spinak, E. J. Pisa, and P. P. Barron (Douglas Aircraft Co., Inc., Missile and Space Systems Div., Advance Electronics Dept., Communications and Electro-Optics Branch, Santa Monica, Calif.).

IEEE, Proceedings, vol. 54, Oct. 1966, p. 1484, 1485.

Description of a setup for measuring optical surface roughness by using coherent radiation produced by a helium-neon laser,  $\sigma$ -polarized at 6328 Å. A comparison of experimental and analytical results suggests the possibility of accurate surface roughness measurements by using the coherence properties of the laser.

V. Z.

**A67-10023****SEMICONDUCTOR LASER ARRAYS AND THEIR CHARACTERISTICS**

L. Wandering and K. L. Kohn (U.S. Army, Electronics Command, Electronic Components Laboratory, Fort Monmouth, N.J.).

IEEE, Proceedings, vol. 54, Oct. 1966, p. 1491, 1492.

Method of using semiconductor laser arrays to achieve a higher optical power output. Since for larger diodes increased spontaneous emission decreases maximum power output and for small diodes increased ohmic losses caused by increased series resistance has the same effect, the development of giant injection laser diodes for increasing power output is fruitless. The development of a semiconductor laser array structure offers a way out of the dilemma. Such an array consists of two or more laser units on a common n-type substrate and individual contacts to the p-layer for comparison

purposes. It has the advantages of uniformity of characteristics, elimination of alignment problems encountered in hookups of individual diodes in series, ease and simplicity of packaging (since only one device is involved), and compatibility with integrated circuits.

W. A. E.

**A67-10065 #****SOME PROPERTIES OF INDIUM PHOSPHIDE BASED SEMI-CONDUCTOR LASERS [NEKOTORYE SVOISTVA POLUPROVODNIKOVIKH KVANTOVYKH GENERATOROV NA OSNOVE FOSFIDA INDIJA].**

N. G. Basov, P. G. Eliseev, I. Ismailov, A. Ia. Nashel'skii, I. Z. Pinsker, and S. V. Iakobson (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

Fizika Tverdogo Tela, vol. 8, Sept. 1966, p. 2610-2615. 12 refs. In Russian.

Description of InP diodes producing coherent radiation at wavelengths from 9060 to 9080 Å. A low loss factor (about 7 cm<sup>-1</sup>) and a fairly low amplification coefficient, given in linear approximation as  $3.4 \times 10^{-3} \times j$  (where  $j$  is the current density), are characteristics of this type of diode. The typical radiation pattern in a plane normal to the p-n junction plane is 5 to 7°, and the differential effectiveness is 0.10 to 0.13 at 77°K.

V. Z.

**A67-10066 #****PROPERTIES OF GALLIUM ARSENIDE DIODE LASERS [SVOISTVA DIODNYKH KVANTOVYKH GENERATOROV, IZGOTOVLENNYKH IZ ARSENIDA GALLIJA].**

N. G. Basov, P. G. Eliseev, S. D. Zakharov, Ju. P. Zakharov, I. N. Oraevskii, I. Z. Pinsker, and V. P. Strakhov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

Fizika Tverdogo Tela, vol. 8, Sept. 1966, p. 2616-2622. 10 refs. In Russian.

Study of the threshold and power characteristics of GaAs-based lasers at 77°K in pulsed regime. In the most perfect of the examined individual lasers the mean coefficient of losses is about 5 cm<sup>-1</sup> (for radiation propagating along the p-n junction), the radiation quantum yield is 0.5 to 1.0, the differential effectiveness reaches 0.67, the efficiency is 0.25 and the light amplification factor is  $3 \times 10^{-2} \times j$  cm<sup>-1</sup>. A correlation between the differential effectiveness and the threshold current density is noted.

V. Z.

**A67-10069 #****NUMBER OF GENERATING MODES IN SOLID-BODY LASERS USING A TRAVELING WAVE AND STANDING WAVE [O CHISLE GENERIRUIUSHCHIKH MOD V TVERDOTEL'NYKH OKG BEGUSHCHEI I STOIACHEI VOLNY].**

S. G. Zeiger and E. E. Fradkin (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR).

Fizika Tverdogo Tela, vol. 8, Sept. 1966, p. 2655-2659. 8 refs. In Russian.

Proof of the generating capability of two modes with frequencies  $\omega_1$  and  $\omega_2$  when  $|\omega_1 - \omega_2| > |\omega_1 - \omega_2|_0$ . Various types of the line broadening involved are considered.

V. Z.

**A67-10071 #****DESTRUCTION OF LiF SINGLE CRYSTALS UNDER THE EFFECT OF LASER RADIATION [O RAZRUSHENII MONOKRISTALLOV LiF POD DEISTVIEM LAZERNOGO IZLUCHENIIA].**

N. V. Volkova, V. A. Likhachev, S. M. Ryvkina, V. M. Salmanov, and I. D. Iaroshetskii (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR).

Fizika Tverdogo Tela, vol. 8, Sept. 1966, p. 2668-2671. In Russian.

Experimental investigation of the peculiar features of the destruction of LiF single crystals as a function of laser-beam energy. A study of the microstructure of the cleavage surface

## A67-10075

reveals a characteristic dislocation pattern arising from intermittent crack propagation as a result of the peak-type mode of laser operation. A characteristic feature of the pattern is circles and ellipses formed by dislocations distributed pairwise in the  $\langle 100 \rangle$  direction.

V. P.

## A67-10075 #

FORMATION OF PARAMAGNETIC CENTERS IN POLYMERS EXPOSED TO THE EFFECT OF LASER RADIATION [VOZNIKNOVENIE PARAMAGNITNYKH TSENTRV V POLIMERAKH, PODVERG-NUTYKH DEISTVIU LAZERNOGO IZLUCHENIYA].

B. M. Ashkinadze, V. A. Likhachev, S. M. Ryvkin, V. M. Salmanov, E. E. Tomashevskii, and I. D. Iaroshetskii (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR). *Fizika Tverdogo Tela*, vol. 8, Sept. 1966, p. 2735-2737. In Russian.

Discussion of experiments in which cylindrical samples of polymethylmethacrylate and polystyrene were exposed to ruby ( $\lambda = 0.69 \mu$ ) and neodymium-glass ( $\lambda = 1.08 \mu$ ) laser radiation. Radio-spectrometric studies revealed the appearance of distinct EPR in the samples, after a certain threshold value of energy density (characteristic for each type of sample) was surpassed. The nature of the EPR in each of the substances is studied, together with the kinetics of the formation and vanishing of the paramagnetic centers responsible for the EPR.

V. P.

## A67-10077 #

INFLUENCE OF THE SURFACE ON THE CHARACTERISTICS OF INJECTION SEMICONDUCTOR LASERS [VLIANIE POVERKHNOSTI NA KHARAKTERISTIKI INZHEKSIONNYKH POLUPROVODNIKOVYKH KVANTOVYKH GENERATOROV].

O. D. Knab, V. I. Magalias, A. S. Logginov, and A. S. Astaf'ev. *Fizika Tverdogo Tela*, vol. 8, Sept. 1966, p. 2768, 2769. In Russian.

Demonstration that the state of a diode's surface (lateral and resonator faces) has an essential influence on the output parameters of a laser. If the surface has a nonradiative nature, there is a possibility of additional heating up in the p-n junction.

S. Z.

## A67-10080 #

SOME PROPERTIES OF GaAs LASERS WITH AN EPITAXIAL p-n JUNCTION AT ROOM TEMPERATURE [NEKOTORYE SVOISTVA KVANTOVYKH GENERATOROV IZ GaAs S EPITAKSIAL'NYM p-n PEREKHODOM PRI KOMNATNOI TEMPERATURE].

L. M. Kogan, L. D. Libov, D. N. Nasledov, T. F. Nikitina, G. M. Strakhovskii, and B. V. Tsarenkov (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad; Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*Fizika Tverdogo Tela*, vol. 8, Sept. 1966, p. 2789-2791. In Russian.

Discussion of GaAs-based Te and Zn-doped epitaxial p-n junctions used in lasers. The volt-ampere characteristics, the threshold current densities, and the power parameters of lasers using such junctions are given.

V. Z.

## A67-10083 #

EFFECT OF CURRENT INJECTIONS ON THE RESPONSE CHARACTERISTICS OF GaAs LASER RADIATION [VLIANIE TOKA INZHEKTSII NA VREMENNYE KHARAKTERISTIKI IZLUCHENIYA PKG NA GaAs].

N. G. Basov, Iu. A. Drozhbin, Iu. P. Zakharov, V. V. Nikitin, A. S. Semenov, B. M. Stepanov, A. M. Tolmachev, and V. A. Iakovlev (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*Fizika Tverdogo Tela*, vol. 8, Sept. 1966, p. 2816-2818. In Russian.

Investigation of the dependence of the delay time of light emission of a diode on the injection current. A PIM-3 image-converter tube with a light amplifier was used as a receiver and light recorder for determining the delay time. The measured delay time shows that GaAs lasers can be used for the modulation of light radiation in the centimeter range and for a high-speed switch (on the order of  $10^{-10}$ - $10^{-11}$  sec).

S. Z.

## A67-10085

SOME FEATURES OF THE COHERENT RADIATION OF GALLIUM ANTIMONIDE LASER DIODES.

I. V. Kriukova, M. S. Mirgalovskaia, V. G. Karnaukhov, A. M. Baranova, and I. A. Strel'nikova.

*(Fizika Tverdogo Tela*, vol. 8, Apr. 1966, p. 1028-1034.)

*Soviet Physics - Solid State*, vol. 8, Oct. 1966, p. 822-826. 19 refs. Translation.

[For abstract see issue 16, page 2721, Accession no. A66-31764]

## A67-10087

SEMICONDUCTOR p-n JUNCTION LASERS IN THE  $\text{InAs}_{1-x}\text{Sb}_x$  SYSTEM.

N. G. Basov, A. V. Dudenkova, A. I. Krasil'nikov, V. V. Nikitin, and K. P. Fedoseev (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*(Fizika Tverdogo Tela*, vol. 8, Apr. 1966, p. 1060-1063.)

*Soviet Physics - Solid State*, vol. 8, Oct. 1966, p. 847-849. 5 refs. Translation.

[For abstract see issue 16, page 2721, Accession no. A66-31767]

## A67-10088

SPONTANEOUS AND COHERENT RADIATION OF ELECTRON-HOLE PLASMA IN INDIUM ANTIMONIDE.

A. P. Shotov, S. P. Grishchikina, B. D. Kopylovskii, and R. A. Muminov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*(Fizika Tverdogo Tela*, vol. 8, Apr. 1966, p. 1083-1087.)

*Soviet Physics - Solid State*, vol. 8, Oct. 1966, p. 865-868. 14 refs. Translation.

[For abstract see issue 16, page 2721, Accession no. A66-31768]

## A67-10101

COHERENT RADIATION FROM p-n JUNCTIONS IN INDIUM ARSENIDE-PHOSPHIDE.

P. G. Eliseev, I. Ismailov, A. Ia. Nashel'skii, and V. Z. Ostrovskaya (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*(Fizika Tverdogo Tela*, vol. 8, Apr. 1966, p. 1283-1285.)

*Soviet Physics - Solid State*, vol. 8, Oct. 1966, p. 1025, 1026.

7 refs. Translation.

[For abstract see issue 16, page 2721, Accession no. A66-31788]

## A67-10106

ULTRA-LOW-NOISE AMPLIFIER USING A POSITIVE RESISTANCE UP-CONVERTER.

E. Sard, B. Peyton, and S. Okwit (Cutler-Hammer, Inc., Airborne Instruments Laboratory Div., Deer Park, N.Y.).

*(G-MTT International Symposium on Microwave Theory and Techniques, Palo Alto, Calif., May 16-18, 1966, Paper.)*

*Frequency*, vol. 4, Sept.-Oct. 1966, p. 38, 39.

Brief description of the design of an ultralow-noise, tunable S-band amplifier using a traveling wave maser (TWM) as the second

stage. The amplifier is made up of a cooled, tunable, low-noise S-band varactor up-converter; a fixed-tuned, high-gain, C-band TWM; and an uncooled, tunable varactor down-converter connected in cascade. This receiver configuration has the advantage of combining the large tuning range capability of a parametric up-converter with the ultralow-noise temperature and unconditional stability of a maser.

S. Z.

**A67-10152 \***

SATURATION BEHAVIOR OF A DOPPLER-BROADENED TRANSITION INVOLVING LEVELS WITH CLOSELY SPACED STRUCTURE. H. R. Schlossberg and A. Javan (Massachusetts Institute of Technology, Dept. of Physics, Cambridge, Mass.).

*Physical Review, 2nd Series*, vol. 150, Oct. 7, 1966, p. 267-284. 15 refs.

USAF-NASA-supported research.

Analysis of the nonlinear absorption or gain characteristics of an optical-frequency, Doppler-broadened atomic resonance involving levels with closely spaced structure. The level structures are assumed to be resolved with respect to their natural widths but not necessarily with respect to the Doppler width at the optical transition. The radiation field consists of two closely spaced monochromatic frequencies lying within the Doppler width of the resonance. This type of radiation field may be obtained, for example, from a laser operating in two of its Fabry-Pérot resonator modes. It is shown that, because of saturation of level populations and double-quantum Raman transitions between levels, appreciable nonlinear coupling takes place between the two fields. This coupling shows a resonance behavior when the frequency separation of the two applied fields becomes equal to the frequency splitting between two of the components which form either level structure.

M. M.

**A67-10161**

LASER GENERATOR OF ORDERED PULSE SEQUENCES.

Iu. I. Kruzhilin.

*(Pribery i Tekhnika Eksperimenta)*, vol. 11, Jan.-Feb. 1966, p. 154-156.)

*Instruments and Experimental Techniques*, Sept. 1966, p. 160, 161. Translation.

[For abstract see issue 13, page 2090, Accession no. A66-25322]

**A67-10162**

ALIGNMENT OF MULTIMIRROR LASER.

A. Z. Grasiuk and I. G. Zubarev (Akademii Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*(Pribery i Tekhnika Eksperimenta)*, vol. 11, Jan.-Feb. 1966, p. 156-158.)

*Instruments and Experimental Techniques*, Sept. 1966, p. 162, 163. Translation.

[For abstract see issue 13, page 2090, Accession no. A66-25323]

**A67-10193 #**

FABRICATION AND PERFORMANCE OF CONE CALORIMETERS FOR LASER ENERGY MEASUREMENTS.

B. F. Scott (Birmingham, University, Dept. of Mechanical Engineering, Birmingham, England).

*Journal of Scientific Instruments*, vol. 43, Oct. 1966, p. 685-687.

Discussion of the design of metal cone calorimeters and suggestion of a fabrication technique. Design requirements are considered, and energy and temperature distributions are given. Experimental results show that total energy cannot be inferred from measured average temperature, but they suggest an alternative method which relies on the maximum recorded tip temperature. It is noted that nickel-copper cone calorimeters having both good resistance to surface damage and an excellent geometry are easily fabricated by an electroplating technique.

M. F.

**A67-10231**

INTERFERENCES BETWEEN WAVES DIFFRACTED BY SMALL SCREENS AND A COHERENT BACKGROUND PROVIDED BY A LASER [INTERFERENCES ENTRE LES ONDES DIFFRACTÉES PAR DES ÉCRANS DE FAIBLES DIMENSIONS ET UN FOND COHERENT FOURNI PAR UN LASER].

Jean Roig, Robert Taravellier, and Guy Mas (Montpellier, Université, Laboratoire d'Optique Physique, Montpellier, France). *Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques*, vol. 263, no. 9, Aug. 29, 1966, p. 608-611. 6 refs. In French.

Study of the interferences occurring between waves diffracted by small circular screens or thin wires and a coherent background provided by a laser. It is found that a circular screen or a 20- $\mu$  wire produce, respectively, rings or rectilinear fringes, the square of their distance from the center varying as a sequence of whole numbers. A phase lead of 90° is observed in the case of divergent spherical waves and of 45° in the case of a cylindrical wave. It is shown that the fringe contrast can be accentuated with the aid of a lamella with an absorbing phase.

A. B. K.

**A67-10243**

TIME BEHAVIOR OF LIGHT EMITTED FROM CW GaAs-LASER DIODES [DAS ZEITLICHE VERHALTEN DER LICHTEMISSION VON KONTINUIERLICH BETRIEBENEN GaAs-LASERDIODEN].

H. Salow and K.-W. Benz (Deutsche Bundespost, Fernmeldetechnisches Zentralamt, Forschungsinstitut, Darmstadt, West Germany). *Zeitschrift für angewandte Physik*, vol. 21, no. 3, 1966, p. 179-181. 12 refs. In German.

Experimental investigation showing that the intensity of light emitted by GaAs-laser diodes decreases with time if the diodes are loaded above a characteristic current intensity, the laser threshold increasing proportionally. The effect is ascribed to a radiation-activated field-sustained migration of interstitial foreign atoms in the GaAs crystal.

V. P.

**A67-10244**

HIGH-POWER SOLID-STATE CW LASER EMPLOYING 3-IN. RUBY CRYSTALS [KONTINUIERLICHER HOCHLEISTUNGSFESTKÖRPERLASER UNTER VERWENDUNG VON DREI-ZOLL-RUBINKRYSTALLEN].

K. Gürs and H. Westermeier (Siemens und Halske AG, Forschungslaboratorium, Munich, West Germany).

*Zeitschrift für angewandte Physik*, vol. 21, no. 3, 1966, p. 181-184. 6 refs. In German.

Research supported by the Bundesministerium für wissenschaftliche Forschung.

Discussion of a CW laser which uses 3-in. ruby crystals with 15% mirror transmission and a pumping power of twice the threshold value to produce an output power of 1.6 watts. Laser efficiency exhibits a pronounced increase with pumping power, reaching 0.04% already at 4000 watts. Distinctive features of the laser include simple cooling conditions (a single cycle of tap water), readily exchangeable heavy-duty components, simplicity of design, and small size.

V. P.

**A67-10245**

DETERMINATION OF THE PUMPING POWER AND CRITICAL INVERSION FOR A RUBY LASER [BESTIMMUNG DER ANREGUNGSLEISTUNG UND DER KRITISCHEN INVERSION BEIM RUBINLASER].

H. Weber (Berlin, Technische Universität, I. Physikalisches Institut, Berlin, West Germany).

*Zeitschrift für angewandte Physik*, vol. 21, no. 3, 1966, p. 184-186. 9 refs. In German.

Research supported by the Stiftung Volkswagenwerk.

Development of a method for approximate determination of the absolute values of the pumping power, threshold power, and critical excess population for a ruby laser from measurements of the relative flash-tube intensity. A distinctive feature of the method is that it requires only absolute measurements of time and not of intensity. The results obtained for the special case of exponential decay are compared with exact solutions.

V. P.

**A67-10246**

PROPERTIES OF CHROMIUM-DOPED RUTILE FOR MICROWAVE MASERS [EIGENSCHAFTEN VON CHROMDOTIERTEM RUTIL FÜR MIKROWELLENMASER].

G. Schollmeier and D. Roth (Siemens und Halske AG, Zentrallaboratorium für Nachrichtentechnik, Munich, West Germany).

*Zeitschrift für angewandte Physik*, vol. 21, no. 3, 1966, p. 187-191. 13 refs. In German.

Experimental investigation of the suitability of chromium-doped rutile as the active material for microwave solid-state masers. Measurements performed for a resonator-type maser (at signal frequencies of  $\sim 4$  GHz and crystal orientations for which the two ion complexes that are characteristic of rutile are equivalent) showed the superiority of the arrangement in which the magnetic field is directed along the  $c$  axis of rutile, using the 1-2 transition as the signal transition. For this transition it was possible to obtain an inversion of 10 when pumping the 1-4 transition. The transition probability (the matrix elements of which are given for this case) is also found to be high. The line widths measured (6 to 10 MHz, depending on the degree of doping) are seen to be appreciably smaller than the values found in available publications. A possible explanation for this is seen in the presence of crystal defects in the earlier investigations, which tend to produce an inhomogeneous line broadening. A quantitative comparison with ruby data is included. V. P.

#### A67-10247

INVESTIGATION OF THE FREQUENCY STABILITY OF THE AMMONIA LASER ON THE 3-2 LINE [UNTERSUCHUNG DER FREQUENZGENAUIGKEIT DES AMMONIAKMASERS AUF DER 3-2-LINIE].

H. Hellwig (Heinrich-Hertz-Institut für Schwingungsforschung, Berlin, West Germany).

*Zeitschrift für angewandte Physik*, vol. 21, no. 3, 1966, p. 250-255. 10 refs. In German.

Research supported by the Deutsche Forschungsgemeinschaft.

Experimental investigation aimed at measuring the frequency stability of double-beam ammonia lasers with thermostatic quartz resonators on the 3-2 line. The increased frequency stability assured by this type of resonator (better than  $5 \times 10^{-12}$ ) makes it possible to study with a high degree of accuracy the reproducibility and Doppler shift of the frequency and the effect of molecular density in the beam. Using low beam intensities, beam intensity modulation to avoid the Doppler effect, and a local magnetic field for resonator tuning, it was possible to achieve a reproducibility of  $5 \times 10^{-12}$  and an absolute frequency stability of  $10^{-11}$ . V. P.

#### A67-10248

ASYMMETRIC CO-OPERATIVE SCATTERED LIGHT SPECTRUM IN A THETATRON PLASMA.

D. E. Evans, M. J. Forrest, and J. Katzenstein (United Kingdom Atomic Energy Authority, Atomic Energy Research Establishment, Culham Laboratory, Culham, Berks., England).

*Nature*, vol. 212, Oct. 1, 1966, p. 21-23. 6 refs.

Discussion of a spectrum of scattered light, asymmetrically distributed about the incident light wavelength, obtained in an experiment designed to display the ion term in the light scattering cross section of a plasma. The experiment was conducted on a thetatron using a giant-pulse ruby laser delivering 50-Mw pulses to obtain a narrow emission line. The dispersing element at the detector was a pressure-scanned Fabry-Pérot interferometer which had a free spectral range of 2.55 Å. The striking feature of the scattered light spectrum is the enhancement of the wing to the short wavelength side of the laser line. This is interpreted as arising from a relative drift velocity  $u$  between the electrons and the ions of the plasma leading to the onset of an ion wave instability in the way described by Rosenbluth and Rostoker. F. R. L.

#### A67-10251

INTENSITY-DEPENDENT FREQUENCY SHIFT IN RUBY LASER GIANT PULSES.

D. J. Bradley (London, University, Royal Holloway College, Englefield Green, Surrey, England), G. Magyar, and M. C. Richardson (United Kingdom Atomic Energy Authority, Atomic Energy Research Establishment, Culham Laboratory, Culham, Berks., England).

*Nature*, vol. 212, Oct. 1, 1966, p. 63, 64. 8 refs.

Study of an intensity-dependent frequency shift observed in the course of a general investigation of the spectral outputs of highly monochromatic giant-pulse ruby lasers. A rotating prism, gain-switched type laser and a spherical Fabry-Pérot interferometer with a free spectral range of 750 Mc were used. Interference fringes appeared some 20 nsec after the beginning of the light pulse. The

most conspicuous feature of the fringes is the shift toward increasing diameter and thus increasing frequency. A plot of the observed rate of shift as a function of peak cavity power indicates a linear - i.e., power-dependent - relationship. This linear power relationship suggests that the frequency shift arises from a nonlinear optical electric field effect. An important conclusion is that nonlinear effects in the active medium limit the effective spectral brightness obtainable from giant-pulse ruby lasers. F. R. L.

#### A67-10260

MODULATION OF A HELIUM-NEON LASER BY A MEDIUM-POWER MICROWAVE BEAM [MODULATION D'UN LASER A HELIUM-NEON PAR UNE ONDE HYPER-FREQUENCE DE PUISSANCE MOYENNE]. Jean-François Delpech and Christian Vauge (Paris, Université, Institut d'Electronique Fondamentale, Orsay, Seine-et-Oise, France), Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques, vol. 263, no. 8, Aug. 22, 1966, p. 560-563. In French.

Experimental investigation of the variation of laser beam intensity for a helium-neon laser operating at the  $3s_2 - 3p_4$  transition (the 3.39- $\mu$  line), as a function of temperature and electron density. A schematic diagram of the experimental setup employed is given. It is found that the predominant effect at low pressures is an increase in He(2S) density with increasing temperature and electron density. On the other hand, at higher pressures, there is only a slight increase in He(2S) pressure, because of saturation, and the predominant effect is an increase in the rate of Ne(3p<sub>4</sub>) formation with increasing temperature and electron density. The latter effect is seen to explain the decrease in laser intensity in the presence of microwave modulation. V. P.

#### A67-10300 #

PROBLEMS RELATING THE APPLICATION OF NEW PHOTOELECTRONIC COMPONENTS TO THE RECEPTION AND DEMODULATION OF HIGH-FREQUENCY MODULATED LASER BEAMS [NAGYFREKVENCIAAN MODULÁLT LASERÜGÁRZÁS FELFOGÁSÁRA ÉS DEMODULÁLÁSÁRA HASZNÁLT ÚJ FOTOELEKTROMOS ÉSZLELEMEK].

P. Görrlich, A. Krohs, and H. J. Pohl.

*Finommechanika*, vol. 5, May 1966, p. 145-148. 8 refs. In Hungarian.

Review of the operating principles of photoelectronic devices and description of a method for their optimal application to measurement techniques and automation. The essential parameters of photoelectronic components are analyzed, enabling limits to be evaluated for the design requirements of devices incorporating such components. Problems in recording and measuring instruments which can only be solved by the use of specialized components are considered. The development of laser communication techniques is discussed in terms of photoelectronic devices. New developments in the field of automation which involve the use of light-sensitive components are examined. D. P. F.

#### A67-10362 #

COMPETITION OF TWO TYPES OF OSCILLATIONS IN A TRAVELING-WAVE LASER [KONKURENTSIA DVUKH TIPOV KOLEBANII V OPTICHESKOM KVANTOVOM GENERATORE BEGUSHCHEI VOLNY (GBV)].

S. G. Zeiger and E. E. Fradkin.

(Vsesoiuznyi Simpozium po Nelineinai Optike, 1st, Minsk, Belorussian SSR, June 1965.)

*Optika i Spektroskopiia*, vol. 21, Sept. 1966, p. 386-390. 6 refs. In Russian.

Investigation of equations of two waves in an active medium. The field in a traveling-wave laser is assumed to be the sum of the traveling waves. The active medium is assumed to be a set of moving atoms with a Gaussian distribution of velocities. Cases of homogeneous and inhomogeneous expansion are considered. The two-wave regime is found to be unstable on symmetrical frequencies because the same atom contributes to the generation of both waves. W. A. E.

**A67-10370****LASER ACTION IN OPTICALLY-PUMPED CN.**

M. A. Pollack (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

Applied Physics Letters, vol. 9, Sept. 15, 1966, p. 230-232. 7 refs.

Laser oscillation near  $5.2 \mu$  has been observed during the flash photolysis of cyanogen ( $C_2N_2$ ). A total peak power of more than 10 mw was obtained on three lines, identified as vibrational-rotational transitions in the ground electronic state of CN. The optimum pressure was found to be about 20 torr of cyanogen. Optical pumping is the only mechanism now known to produce laser action on these transitions. (Author)

**A67-10373****NEW VISIBLE CW LASER LINES IN SINGLY-IONIZED CHLORINE.**

C. B. Zarowin (International Business Machines Corp., Thomas J. Watson Research Center, Yorktown Heights, N.Y.).

Applied Physics Letters, vol. 9, Sept. 15, 1966, p. 241, 242. Contract No. AF 33(615)-3655.

Note on the observation of three new visible CW laser lines in a discharge in chlorine. The lines are at wavelengths of 4132.5, 4740.4, and 5103.1 Å. With the exception of the 4740.4-Å line, the laser lines result from 4p to 4s transitions, but all originate from even parity states, terminate at odd parity states, conserve core configuration, and are "allowed" by L-S coupling rules. S.Z.

**A67-10395 =****EFFECT OF NONUNIFORMITY OF MOLECULAR EMISSION ON OSCILLATION FREQUENCY OF A MASER OSCILLATOR.**

V. N. Morozov and A. N. Oraevskii (Akademii Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(Radiotekhnika i Elektronika), vol. 11, Mar. 1966, p. 514-518. Radio Engineering and Electronic Physics, vol. 11, Mar. 1966, p. 433-437. Translation.

The oscillation frequency of a maser oscillator is calculated on the basis of the first approximation of perturbation theory. The correction to the oscillation frequency, normally calculated in the zeroth approximation, depends on the density distribution of the exciting current in the cavity. The correction is found to the oscillation frequency of a maser oscillator with a single beam. (Author)

**A67-10396 =**

**EFFECT OF CONSTANT ELECTRIC AND MAGNETIC FIELDS APPLIED TO A BEAM OF ACTIVE MOLECULES OUTSIDE A RESONATOR ON THE OSCILLATION FREQUENCY OF A MASER.** G. M. Strakhovskii, V. M. Tatarenkov, and P. S. Shumiatskii. (Radiotekhnika i Elektronika), vol. 11, Mar. 1966, p. 519-525. Radio Engineering and Electronic Physics, vol. 11, Mar. 1966, p. 438-443. 6 refs. Translation.

Results are given of investigations of the extent to which the frequency and intensity of oscillation of a maser are affected by inhomogeneous constant electric and magnetic fields acting on a beam of active molecules outside the region of the radio-frequency field of the resonator. The investigated masers operated at radiation lines of  $J = 3, K = 3$  and  $J = 3, K = 2N^{1/2}H_3$ . (Author)

**A67-10445****A DIFFUSELY TRANSMITTING, INTEGRATING SPHERE FOR MEASURING LASER OUTPUT WITH A PHOTOTRANSISTOR.**

K. E. Fligsten and M. L. Wolbarsht (National Naval Medical Center, Naval Medical Research Institute, Bethesda, Md.).

IEEE, Proceedings, vol. 54, Aug. 1966, p. 1109, 1110. 10 refs. Navy Contract No. RAE-13-X-047/5031/R004-01-001; Defense Atomic Support Agency Contract No. MIPR 557-66.

Description of a method for monitoring the output of a laser to obtain data on total energy, power, and other laser characteristics. The method combines the advantages of the fast response time of the photosensitive devices with a simple method for attenuating and averaging the inhomogeneous hot spots in the laser beam. A solid-state photodiode was used as the light-sensitive element in a diffusely transmitting integrating sphere. S.Z.

**A67-10447****INCOHERENT SOURCE OPTICAL PUMPING OF VISIBLE AND INFRARED SEMICONDUCTOR LASERS.**

R. J. Phelan (Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.).

IEEE, Proceedings, vol. 54, Aug. 1966, p. 1119, 1120. 7 refs.

Demonstration that flashlamp pumping of semiconductor lasers is possible. A study was made of laser action in the IR and visible part of the spectrum using InSb and  $CdS_xSe_{1-x}$  pumped with a flashlamp. The incident threshold pump densities for wavelength less than the emission wavelength are tabulated. Electron beam pumping of  $CdS_xSe_{1-x}$  has shown that essentially the whole visible spectrum can be covered with high efficiencies. Even higher efficiencies should be possible with optical pumping. M.F.

**A67-10448****GIANT PULSE LASER ACTION AT 77°K.**

R. Williamson and D. Walsh (Oxford, University, Dept. of Engineering Sciences, Oxford, England).

IEEE, Proceedings, vol. 54, Aug. 1966, p. 1122, 1123.

Research supported by the Paul Instrument Fund; Grant No. AF EOAR 65-37.

Description of the Q-switching of a ruby laser operating at liquid nitrogen temperature. When a cell of 2-mm optical thickness containing chloroaluminum phthalocyanine in chloronaphthalene was introduced, giant pulse laser action was observed. It is shown that, for a typical result, a pulse with a half-width of 30 to 40 nsec was observed. The peak value of the pulse, however, was only about 100 times that for normal laser oscillations. M.M.

**A67-10503 #****EVOLUTION OF MASERS AND LASERS.**

Bela A. Lengyel (Hughes Aircraft Co., Research Laboratories, Malibu; San Fernando Valley State College, Northridge, Calif.).

American Journal of Physics, vol. 34, Oct. 1966, p. 903-913. 41 refs.

Brief review of the major events leading to the development of the maser and laser. The first microwave amplifier of 1954, followed by three-level solid masers, and the first ruby laser of 1960, the four-level ruby laser, and He-Ne lasers are discussed as important stages in the rapidly expanding application of the stimulated emission principle. A large-scale search since 1961 for new laser materials and more effective laser techniques is noted. V.Z.

**A67-10511 #****CROSS SECTIONS OF INELASTIC PROCESSES IN THE HELIUM-NEON LASER.**

I. M. Beterov and V. P. Chebotaev.

(Optika i Spektroskopiia), vol. 20, June 1966, p. 1078-1080.

Optics and Spectroscopy, vol. 20, June 1966, p. 597, 598. 10 refs. Translation.

[For abstract see issue 18, page 3119, Accession no. A66-34695]

**A67-10512 #****TEMPERATURE EFFECTS IN THE Ne-He LASER.**

S. A. Gonchukov, G. A. Ermakov, G. A. Mikhnenko, and E. D. Protsenko.

(Optika i Spektroskopiia), vol. 20, June 1966, p. 1083-1085.

Optics and Spectroscopy, vol. 20, June 1966, p. 601, 602. Translation.

[For abstract see issue 18, page 3119, Accession no. A66-34696]

**A67-10513 #****THE GENERATION OF LASER ACTION IN THE 4f-3d TRANSITIONS OF NEON BY OPTICAL PUMPING OF A He-Ne DISCHARGE WITH HELIUM LAMP.**

V. N. Lisitsyn and V. P. Chebotaev.

(Optika i Spektroskopiia), vol. 20, June 1966, p. 1087, 1088.

Optics and Spectroscopy, vol. 20, June 1966, p. 603, 604. Translation.

[For abstract see issue 18, page 3120, Accession no. A66-34697]



**A67-10548 #**

CONTINUOUS COHERENT RADIATION OF EPITAXIAL GaAs DIODES AT A TEMPERATURE OF 77°K [NEPRERYVNOE KOGHERENTNOE IZLUCHENIE EPITAKSIAL'NYKH DIODOV IZ GaAs PRI TEMPERATURE 77°K].

L. M. Kogan, L. D. Libov, D. N. Nasledov, T. F. Nikitina, I. N. Oraevskii, G. M. Strakhovskii, O. A. Sungurova, and B. V. Tsarenkov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*ZHETF Pis'ma v Redaktsiiu*, vol. 4, Sept. 15, 1966, p. 208-210. In Russian.

Note on the process of continuous radiation of a GaAs semiconductor laser with an epitaxial pn junction at an ambient temperature of 77°K. Continuous coherent radiation appears at a current of 250 ma. The narrow spectral line which appears in this connection apparently reflects a nonaxial "ring"-type oscillation of the resonator. At a current strength of 410 ma, a new system of coherent lines arises which may result from the axial type of resonator oscillations.

S. Z.

**A67-10549 #**

NEW LASER LINES OF A PULSED IODINE VAPOR LASER [NOVYE LINII GENERATSII IMPUL'SNOGO OKG NA PARAKH IODA].

V. M. Koval'chuk and G. G. Petrash (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*ZHETF Pis'ma v Redaktsiiu*, vol. 4, Sept. 15, 1966, p. 210-213. 8 refs. In Russian.

Note on the observation of four new laser lines from a pulse discharge in iodine vapors. The measured wavelengths were: 4533.79 Å, 4674.40 Å, 4934 Å, and 10714.2 Å. It may be assumed from the results of the observations that the lines represent the spectral transition of highly ionized iodine.

S. Z.

**A67-10550 #**

ELECTRON TEMPERATURE IN AN ELECTRIC DISCHARGE APPLIED TO AN ARGON ION LASER [OB ELEKTRONNOI TEMPERATURE V ELEKTRICHESKOM RAZRIADE, PRIMENIAEMOM DLIA ARGONOVOGO IONNOGO OKG].

V. F. Kitaeva, Iu. I. Osipov, and N. N. Sobolev (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*ZHETF Pis'ma v Redaktsiiu*, vol. 4, Sept. 15, 1966, p. 213-216. In Russian.

Attempt to determine electron temperature in an electric discharge in argon under conditions typical of a CW laser. Measurements of the halfwidth of the ArII lines radiating across the discharge were made. Investigations were carried out in a 2.8-mm-diam, 40-cm-long tube with a bypass channel in a gas pressure variation range from 0.21 to 0.62 torr and current density variation range from 150 to 350 amp/cm<sup>2</sup>. Basic characteristics of the discharge have been obtained which are believed to be of considerable importance for understanding the mechanism causing inverse population.

S. Z.

**A67-10683 #**

INFLUENCE OF "ILLUMINATION" IN ZnS(Co) CRYSTALS UNDER THE EFFECT OF GIANT PULSES FROM A RUBY LASER [EFFEKT "PROSVETLENIIA" V KRISTALLAKH ZnS(Co) POD DEISTVIEI GIGANTSKIKH IMPUL'SOV RUBINOVOGO OPTICHESKOGO KVANTOVOGO GENERATORA].

L. N. Galkin.

*Akademiia Nauk SSSR, Doklady*, vol. 170, Sept. 11, 1966, p. 315, 316. 5 refs. In Russian.

Spectrographic investigation of the transmission spectrum of a cobalt-activated zinc sulfide crystal exposed to intense ruby-laser radiation. It is found that at a cobalt concentration of  $2 \times 10^{18} \text{ cm}^{-3}$ , the transmission of a 1-mm thick sample at  $\lambda = 694 \mu$  equaled 4%. The relaxation time of the transition of  $\text{Co}^{2+}$  ions from the  $^4T_1(P)$  to the  $^4A_2(F)$  state is found to equal  $1 \times 10^{-9} \text{ sec}$ .

V. P.

**A67-10740 #**

LASER WITH NONRESONANCE FEEDBACK [OPTICHESKII KVANTOVYI GENERATOR S NEREZONANSNOI OBRATNOI SVIAZ'IU].

R. V. Ambartsumian, N. G. Basov, P. G. Krinkov, and V. S. Letokhov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, vol. 51, Sept. 1966, p. 724-729. 8 refs. In Russian.

Experimental study of a ruby laser with scattering-induced feedback. Proof is given for the absence in this case of resonance-type oscillations characteristic of resonance-feedback lasers. Use of nonresonance feedback is suggested in the development of a laser with stable-frequency light oscillations.

V. Z.

**A67-10759**

GENERATION OF VERY INTENSE PULSES AT 5300 Å WITH THE AID OF A VERY-HIGH-POWER LASER - SATURATION AND POSSIBILITIES IN THE NEAR ULTRAVIOLET [GENERATION D'IMPULSIONS TRES INTENSES A 5300 Å AVEC UN LASER DE TRES GRANDE PUISSANCE - SATURATION ET POSSIBILITES DANS LE PROCHE ULTRAVIOLET].

Michèle Leblanc, Jean Hanus, and Bernard Sturel (Compagnie Générale d'Electricité de Paris, Centre de Recherches, Marcoussis, Seine-et-Oise, France).

*Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques*, vol. 263, no. 11, Sept. 12, 1966, p. 701-704. 12 refs. In French.

Method for generating very intense pulses at 5300 Å by frequency doubling. It is shown that a green light pulse of 7 joules can be obtained in 27 nsec with the aid of a Q-switched neodymium glass laser yielding 50 joules at 1.06  $\mu$  in 33 nsec. The possibility of generating the fifth harmonic of 1.06  $\mu$  is envisaged, and methods of generating the third and fourth harmonics are suggested.

A. B. K.

**A67-10813**

COUPLING EFFECTS IN A PASSIVE Q-SWITCHED RUBY LASER.

V. Degiorgio (Centro Informazioni Studi Esperienze, Laboratori, Milan, Italy) and M. Giglio (Centro Informazioni Studi Esperienze, Laboratori, Milano, Università, Istituto di Fisica, Milan, Italy).

*Nuovo Cimento*, vol. 45B, Sept. 11, 1966, p. 69-71. 6 refs.

Research supported by the Consiglio Nazionale delle Ricerche.

Demonstration of the existence of a coupling mechanism in passive Q-switching operation between filaments in different regions of a ruby laser rod. The experimental results obtained seem to agree with the hypothesis of diffraction coupling, using medium-quality ruby rods. It is noted, however, that another type of coupling, due to scattering and optical distortions, has necessarily to be active in order to account for the transverse coupling observed even in the presence of large diaphragms, using a ruby rod of poor quality.

M. M.

**A67-10827 \* #**

INEXPENSIVE CO<sub>2</sub> MOLECULAR GAS LASER.

S. Kozeckanani, J. McCoy, and D. Rensch (Ohio State University, Dept. of Electrical Engineering, Antenna Laboratory, Columbus, Ohio).

*American Journal of Physics*, vol. 34, Oct. 1966, p. 989, 990. 7 refs.

Grant No. NSG-74-60.

Note on the possibility of a molecular carbon-dioxide gas laser with relatively inexpensive components. The laser uses plano-concave eyeglass lenses with a diopter of -1/8th. An experimental laser of this type is described and its performance is discussed.

V. Z.

**A67-10832 #**

LASER RESOLVOMETRY [LAZERNAIA REZOL'VOMETRIIA].

A. N. Zaidel', V. B. Konstantinov, and Iu. I. Ostrovskii (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR).

*Zhurnal Nauchnoi i Prikladnoi Fotografii i Kinematografii*, vol. 11, Sept.-Oct. 1966, p. 381, 382. In Russian.

Brief note on an improved interferential method of testing high-resolution photographic emulsions. The improved version uses a laser as the light source, thus reducing the technical difficulties of the original version. The optical system used is shown

in diagram form and the results of film tests by the method are briefly discussed.

V. Z.

**A67-10835**

EXCITATION OF SIGNALS IN A NEGATIVELY CHARGED POST OF AN ANTENNA UNDER THE INFLUENCE OF AN UNFOCUSED LASER BEAM.

G. A. Askar'ian, M. S. Rabinovich, A. D. Smirnova, V. K. Stepanov, and V. B. Studenov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(ZHETF Pis'ma v Redaktsiiu, vol. 4, Sept. 1, 1966, p. 177-180.)

JETP Letters, vol. 4, Sept. 1, 1966, p. 122, 123. Translation.

[For abstract see issue 24, category 16, Accession no. A66-42753]

**A67-10836**

COHERENT AMPLIFICATION OF RADIO EMISSION IN A COSMIC MEDIUM.

D. A. Varshalovich (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR).

(ZHETF Pis'ma v Redaktsiiu, vol. 4, Sept. 1, 1966, p. 180-182.)

JETP Letters, vol. 4, Sept. 1, 1966, p. 124, 125. Translation.

[For abstract see issue 24, category 29, Accession no. A66-42754]

**A67-10837**

GIANT SUPERLUMINESCENCE PULSES.

V. S. Zuev, V. S. Letokhov, and Iu. V. Senatskii (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(ZHETF Pis'ma v Redaktsiiu, vol. 4, Sept. 1, 1966, p. 182-185.)

JETP Letters, vol. 4, Sept. 1, 1966, p. 125-127. Translation.

[For abstract see issue 24, category 16, Accession no. A66-42755]

**A67-10875**

PTM SINGLE-PULSE SELECTION FROM A MODE-LOCKED  $\text{Nd}^{3+}$ -GLASS LASER USING A BLEACHABLE DYE.

A. W. Penney, Jr. and H. A. Heynau (United Aircraft Corp., Research Laboratories, East Hartford, Conn.).

Applied Physics Letters, vol. 9, Oct. 1, 1966, p. 257, 258. 5 refs.

The selection of a single mode-locked pulse from a Q-switched  $\text{Nd}^{3+}$ -doped glass laser is described. Mode-locking is achieved by self-mode-locking the laser using a bleachable dye Q switch.

Selection of a single pulse is achieved by means of a modification of the pulse transmission mode described by Vuylsteke. (Author)

**A67-10879**

VOLUME EXCITATION OF AN ULTRATHIN SINGLE-MODE CdSe LASER.

G. E. Stillman, M. D. Sirkis, J. A. Rossi, M. R. Johnson, and N. Holonyak, Jr. (Illinois, University, Dept. of Electrical Engineering and Materials Research Laboratory, Urbana, Ill.).

Applied Physics Letters, vol. 9, Oct. 1, 1966, p. 268, 269.

USAF-ARPA-supported research.

Description of ultrathin CdSe lasers of variable mode spacing, including the special case of optical pumping with a diode laser directly into one Fabry-Pérot resonator face of a thin, highly absorbing semiconductor sample. A simple experimental procedure for volume optical excitation of this thin semiconductor sample is described. This technique has yielded perhaps the most closely spaced Fabry-Pérot structure laser in existence and, in addition, affords a CdSe laser of very high mode resolution. The case of single-mode output is discussed.

M.F.

**A67-10912**

THERMALIZATION OF PLASMA ELECTRONS.

P. J. Bottoms and M. Eisner (Texas Agricultural and Mechanical University, Dept. of Physics, College Station, Tex.).

Physical Review Letters, vol. 17, Oct. 24, 1966, p. 902, 903.

Research supported by the Texas Atomic Energy Research Foundation.

Measurements of the rate of thermalization of a highly ionized plasma with initially hot ions and cold electrons. The results of

the measurements are graphed along with the appropriate theoretical curve. In view of the fact that density is not exactly constant during the thermalization process, the agreement with theory is considered to be satisfactory, and it is concluded that electron-ion interaction through wave-particle interactions is not a significant feature in this experimental domain.

M.F.

**A67-11011 #**

NONLINEAR OPTICAL MATERIALS [NELINEINYE OPTICHESKIE MATERIALY].

V. S. Suvorov and A. S. Sonin.

Kristallografiia, vol. 11, Sept.-Oct. 1966, p. 832-848. 63 refs. In Russian.

Discussion of the properties of nonlinear optical materials on the basis of recent Soviet and foreign studies involving lasers. Among the topics considered are the phenomenological theory, the symmetry of the quadratic polarization tensor, the directions of synchronism in crystals, and second harmonic generation in some types of crystals.

V. Z.

**A67-11024**

THE GENERATION OF NARROW BEAM DIVERGENT "Q" SWITCHED LASER PULSES.

Glenn A. Hardway (Spacerays, Inc., Applied Lasers Div., Stoneham, Mass.).

Instrument Society of America, Annual Conference and Exhibit, 21st, New York, N.Y., Oct. 24-27, 1966, Preprint. 3 p. 6 refs.

Members, \$0.75; nonmembers, \$1.00.

A brief discussion is given of "state of the art" high-powered Q-switched laser system and techniques utilized in obtaining giant pulses from a ruby laser device. The output characteristics of the devices are discussed along with a few basic areas of applications.

(Author)

**A67-11034**

UNICON - COHERENT LIGHT DATA PROCESSING.

C. H. Becker (Precision Instrument Co., Palo Alto, Calif.).

Instrument Society of America, Annual Conference and Exhibit, 21st, New York, N.Y., Oct. 24-27, 1966, Preprint. 12 p. 6 refs.

Members, \$0.75; nonmembers, \$1.00.

Description of the unidensity coherent light processing system (UNICON). The system uses coherent laser radiation in a rotating optical system to create and detect, as well as record and reproduce, information elements in two dimensions, through diffraction-limited evaporation of a special recording medium. It is noted that UNICON has excellent potential of being the ultimate in data processing, with wide application in mass data storage and retrieval, as well as in broadcasting, color television, instrumentation recording for telemetry, reconnaissance, automatic control, etc.

M.M.

**A67-11036**

LASER EXTENSOMETER.

W. J. Coleman (Battelle Memorial Institute, Pacific Northwest

Laboratories, Optical Laboratory, Richland, Wash.).

Instrument Society of America, Annual Conference and Exhibit, 21st, New York, N.Y., Oct. 24-27, 1966, Preprint. 8 p.

Members, \$0.75; nonmembers, \$1.00.

AEC Contract No. AT(45-1)-1830.

The laser extensometer was developed to accurately measure small dimensional changes of a specimen on a tensile testing vacuum furnace operating at high temperatures. A CW helium-neon gas laser is used as the light source. The collimated laser beam is reflected from a rotating mirror to sweep past two flags attached to a specimen located at the center of the furnace. The mirror is rotated by a hysteresis, synchronous motor driven by an amplified 60 cps tuning fork signal. The beam is focused to a small spot at the specimen flag plane and recollected on the other side to be incident on a photomultiplier tube. The collecting lens sees only the light that passes between the flags. The phototube acts as an on-off switch to turn the timer on and off. In front of the phototube, a narrow band-pass filter is used to discriminate against background light from the high temperature specimen. An overall accuracy of  $\pm 0.00015$  in. per 0.3 in. range has been achieved.

(Author)

**A67-11056**

CONTINUOUS COHERENT RADIATION OF EPITAXIAL DIODES OF GaAs AT 77°K.

L. M. Kogan, L. D. Libov, D. N. Nasledov, T. F. Nikitina, I. N. Oraevskii, G. M. Strakhovskii, O. A. Sungurova, and B. V. Tsarenkov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(ZHETF Pis'ma v Redaktsiiu, vol. 4, Sept. 15, 1966, p. 208-210.)

JETP Letters, vol. 4, Sept. 15, 1966, p. 143, 144. Translation.

[For abstract see issue 01, category 16, Accession no. A67-10548]

**A67-11057**

NEW GENERATION LINES OF A PULSED IODINE-VAPOR LASER. V. M. Koval'chuk and G. G. Petrash (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(ZHETF Pis'ma v Redaktsiiu, vol. 4, Sept. 15, 1966, p. 210-213.)

JETP Letters, vol. 4, Sept. 15, 1966, p. 144-146. 8 refs. Translation.

[For abstract see issue 01, category 16, Accession no. A67-10549]

**A67-11058**

ELECTRON TEMPERATURE IN THE ELECTRIC DISCHARGE USED FOR THE ARGON ION LASER.

V. F. Kitaeva, Iu. I. Osipov, and N. N. Sobolev (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(ZHETF Pis'ma v Redaktsiiu, vol. 4, Sept. 15, 1966, p. 213-216.)

JETP Letters, vol. 4, Sept. 15, 1966, p. 146-148. Translation.

[For abstract see issue 01, category 16, Accession no. A67-10550]

**A67-11062 #**

COHERENCE OF LIGHT FROM RANDOM MEDIUM.

Takeomi Suzuki and Ryuichi Hioki (Tokyo, University, Dept. of Applied Physics, Tokyo, Japan).

Japanese Journal of Applied Physics, vol. 5, Sept. 1966, p. 807-813. 10 refs.

Theoretical descriptions of the statistics of the speckled diffraction patterns of diffused coherent light. The amplitude of light disturbance in a diffused-source surface is expressed by a spatially continuous complex function. The spatial correlation of the phase angle of the amplitude is discussed, and the space-averaged coherence area of phase is given. The power-spectral density of the diffraction pattern in terms of spatial frequency is shown to be proportional to the autocorrelation function of the intensity distribution of the diffused source and also to the coherence area of phase. B.B.

**A67-11063 #**

SPECKLED DIFFRACTION PATTERN AND SOURCE EFFECT ON RESOLUTION LIMIT IN HOLOGRAPHY.

Takeomi Suzuki and Ryuichi Hioki (Tokyo, University, Dept. of Applied Physics, Tokyo, Japan).

Japanese Journal of Applied Physics, vol. 5, Sept. 1966, p. 814-817. 5 refs.

Description of the speckled pattern in a diffusely illuminated Fourier-transform hologram. The distortion term in the reconstructed image is shown to be proportional to the convolution of the intensity distribution of the object against itself, and the point-spread function in the image is revealed to be proportional to the convolution of the intensity distributions of the reference sources and of the reconstruction. The anisotropy in resolution by the source effect is indicated with an experimental illustration. B.B.

**A67-11072 #**

OPTICAL GAIN AND LOSSES OF SOLUTION-GROWN-DIFFUSED GaAs INJECTION LASERS.

Wataru Susaki (Mitsubishi Electric Corp., Central Research Laboratories, Hyogo, Japan).

Japanese Journal of Applied Physics, vol. 5, Sept. 1966, p. 845, 846. 9 refs.

Description of the simultaneous derivation of values about 10 times higher for the gain factor ( $\beta$ ) and the loss per unit length ( $\alpha$ ) in a series of solution-grown-diffused lasers than in ordinary diffused types between 77 and 300°K. The computed values for  $\alpha$  and  $\beta$  at 77, 195, and 300°K are tabulated. B.B.

**A67-11079**

EFFECTS OF PARTIAL COHERENCE ON HOLOGRAPHY WITH DIFFUSE ILLUMINATION.

M. Lurie (Newark College of Engineering, Newark, N.J.).

Optical Society of America, Journal, vol. 56, Oct. 1966, p. 1369-1372. 5 refs.

Research supported by the Newark College of Engineering.

Mathematical description of the process of producing a hologram of an object that is transmitting or reflecting diffuse, partially coherent, quasi-monochromatic light. The discussion shows how the degree of coherence between the reference beam and the beam illuminating the object affects the reconstruction. The types of image degradation resulting from the use of partially coherent light are outlined. The application of holography to the measurement of second-order spatial coherence is suggested and a possible experiment is described. (Author)

**A67-11084**

LASER-EXCITED ELECTRONIC RAMAN SPECTRUM OF EUROPIUM YTTRIUM GALLIUM GARNET [ $\text{Eu}^{3+}\text{YGaG}$ ].

J. A. Koningstein (Carleton University, Dept. of Chemistry, Ottawa, Canada).

Optical Society of America, Journal, vol. 56, Oct. 1966, p. 1405, 1406. 5 refs.

Research supported by the National Research Council of Canada.

Description of experiments in which the Raman spectrum was excited with the 6328-Å line of a He-Ne gas laser. The spectrum was photoelectrically recorded rather than photographed. The Raman spectra of  $\text{Eu:YGaG}$  at room temperature and at 77°K are graphed. S.Z.

**A67-11085**

TEMPERATURE-DEPENDENT Nd FLUORESCENCE PARAMETERS AND LASER THRESHOLDS.

W. W. Holloway, Jr., M. Kestigian, F. F. Y. Wang, and G. F. Sullivan (Sperry Rand Corp., Sperry Rand Research Center, Sudbury, Mass.).

Optical Society of America, Journal, vol. 56, Oct. 1966, p. 1409, 1410. 8 refs.

Contract No. DA-44-009-AMC-772(T).

Demonstration that the temperature-dependence of the threshold for stimulated emission of a crystal laser device can be predicted from the intensity variation of the laser-active fluorescence components. The predicted temperature of the threshold for the  $\text{Nd}^{3+}$  ion for several host lattices is compared with experimental results. S.Z.

**A67-11132**

A UNIQUE CONCEPT IN DYNAMIC OPTICS AS RELATED TO INSTRUMENTATION.

Juan de la Cierva (Dynasciences Corp., Blue Bell, Pa.).

IN: INSTRUMENT SOCIETY OF AMERICA, NATIONAL AEROSPACE INSTRUMENTATION SYMPOSIUM, 12TH, PHILADELPHIA, PA., MAY 2-4, 1966, PROCEEDINGS. [A67-11108 01-14] Pittsburgh, Instrument Society of America, 1966, p. 229-246.

Description and technical discussion of the DYNALENS optical element in its simple and achromatic versions. It is characterized by a variable-geometry fluid prism that deflects a beam of light or electromagnetic energy. In its simplest form the DYNALENS consists of two circular pieces of optical plate glass and a flexible bellows enclosing the liquid-filled volume between the two glass plates. The achromatic version consists of two simple elements of which one is a corrective element. The device has applications in laser beam stability, optical missile guidance, fire control from mobile weapons platforms, and stabilized binocular and monoculars. Its optical and environmental data are discussed. W.A.E.

**A67-11322****SINGLE-BEAM-LASER ROTATION-RATE SENSOR.**

Paul Fenster and Walter K. Kahn (Brooklyn, Polytechnic Institute, Dept. of Electrophysics, Brooklyn, N.Y.).

*Electronics Letters*, vol. 2, Oct. 1966, p. 380, 381.

Contract No. AF 49(638)-1402.

An audio frequency proportional to the rotation rate of a re-entrant laser-cavity or -ring system has been derived from a single output beam of such a system. Experiments were carried out with a He-Ne laser at 6328 Å. The output-signal amplitude falls rapidly with increasing audio frequency. The locking frequency is lower than that for conventional dual-beam arrangements. (Author)

**A67-11437****LASER BEAM AND ELECTRON BEAM EXTREMELY WIDEBAND INFORMATION STORAGE AND RETRIEVAL.**

Leo Beiser (Columbia Broadcasting System, Inc., CBS Laboratories, Intelligence System Dept., Stamford, Conn.).

*Photographic Science and Engineering*, vol. 10, July-Aug. 1966, p. 222-228, 8 refs.

Study of the relative merits of various information storage and retrieval methods. Electron beam and laser beam scanning techniques are discussed, along with silver halide and thermoplastic storage methods. It is shown that the laser beam and electron beam can be focused to power densities in excess of  $10^5$  watts/cm<sup>2</sup> and that similar electron and photon energies are required to expose silver halide to similar density and resolution. The relative characteristics of three potential systems are tabulated: electron beam on silver halide, electron beam on thermoplastic, and laser beam on silver halide. B.B.

**A67-11573 #****WIDTH OF THE ANGULAR AND FREQUENCY SPECTRUM OF THE EMISSION OF A LASER WITH A NONLINEAR ABSORBER [O SHIRINE UGLOVOGO I CHASTOTNOGO SPEKTRA IZLUCHENIIA OKG S NELINEINYM POGLOTITELEM].**

M. M. Sushchik and G. I. Freidman (Gor'kovskii Gosudarstvennyi Universitet, Nauchno-Issledovatel'skii Radiofizicheskii Institut, Gorki, USSR).

*Radiofizika*, vol. 9, no. 5, 1966, p. 919-922. In Russian.

Derivation of an expression for the ratio between the number of photons in various modes of a laser with a nonlinear filter serving as a gate. Assuming that the molecules of the active medium and the molecules of the nonlinear filter have a two-level structure and taking spontaneous emission into account, it is shown that in a laser with a nonlinear absorber and nearly flat mirrors it is comparatively easy to obtain the conditions of excitation of only one resonator mode. The assumption that during a giant pulse the differences between the populations of the active medium and the nonlinear filter do not depend on the coordinates is shown to be false. A.B.K.

**A67-11574 #****CHARACTERISTICS OF A MASER OPERATING ON A HYDROGEN-ATOM BEAM [KHARAKTERISTIKI KVANTOVOGO GENERATORA NA PUCHKE ATOMOV VODORODA].**

A. I. Nikitin and G. M. Strakhovskii (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*Radiofizika*, vol. 9, no. 5, 1966, p. 923-931, 8 refs. In Russian.

Study of the amplitude and frequency characteristics of a maser operating on a hydrogen-atom beam. A determination is made of the following dependences: of the power of the generation signal on the intensity of the atomic beam and the current passing through the windings of a focusing six-pole electromagnet; of the effective capture angle of the focusing six-pole magnet on the field strength at the poles; of the power of the generation signal on the magnetic field strength created by a solenoid; of the relaxation rates on the strength of an axial magnetic field created by a solenoid; of the generation frequency on the resonator retuning for various atomic-beam intensities; of the generation frequency on the atomic-beam intensity for various resonator mismatches; and of the generation frequency on the resonator retuning in the presence of an inhomogeneous magnetic field and in the absence of such a field. A.B.K.

**A67-11575 #****THEORY OF A PARAMETRIC LIGHT GENERATOR [K TEORII PARAMETRICHESKOGO GENERATORA SVETA].**

Iu. V. Grigor'ev, V. K. Rudenko, and R. V. Khokhlov (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR).

*Radiofizika*, vol. 9, no. 5, 1966, p. 932-941, 15 refs. In Russian.

Study of parametric excitation of oscillations in a Fabry-Pérot resonator filled with a nonlinear dispersing medium. Using a single-mode approximation, special attention is devoted to a study of the behavior of the system when the synchronism of the waves interacting in the resonator breaks down and when the resonator frequency differs from the frequency of the parametric oscillations. The condition of self-excitation of oscillations is obtained. The steady-state conditions are investigated, and their stability is analyzed. A comparison is made between the parametric interaction in this system and in a system with lumped parameters. A.B.K.

**A67-11652 #****"LASER" NATURE OF TYPE I SOLAR RADIO BURSTS [O "LAZER NOI" PRIRODE SOLNECHNYKH RADIOVSPLESKOV PЕРVOGO TИPA].**

E. I. Mogilevskii (Akademiia Nauk SSSR, Institut Zemnogo Magnetizma, Ionosfery i Rasprostraneniia Radiovoln, Krasnaya Pakhra USSR).

(Plenum KISO, Baku, Azerbaidzhan SSR, Oct. 1963.)

*Geomagnetizm i Aeronomiia*, vol. 6, Sept.-Oct. 1966, p. 809-814, 15 refs. In Russian.

Formulation of a hypothesis that narrow-band radiowave bursts of type I are produced by magnetic-dipole transitions in split Zeeman sublevels of hydrogen atoms of the solar corona in the ground state. Optical pumping can take place through resonance scattering of  $L_{\alpha}$ -quanta by the chromosphere, and population inversion as a result of inductive transitions under the influence of an intensified polarized radiation over a meter range. An explanation of the peculiarities of type I radiowave bursts is included. S.Z.

**A67-11785****DEFENSE ELECTRONIC PRODUCTS APPLIED RESEARCH.**

Camden, N.J., Radio Corporation of America, 1966. 44 p.

**CONTENTS:**

LASER VOICE AND VIDEO COMMUNICATIONS - APPLYING THE GaAs ROOM-TEMPERATURE INJECTION LASER AND THE GaAs ELECTRO-OPTIC CRYSTAL. W. J. Hannan and J. Bordogna (Radio Corporation of America, Camden, N.J.), p. 2-7. 6 refs. [See A67-11786 02-07]

TRAVELING WAVE MASERS - A REVIEW. J. Vollmer (Radio Corporation of America, Camden, N.J.), p. 32-38. [See A67-11787 02-16]

**A67-11786****LASER VOICE AND VIDEO COMMUNICATIONS - APPLYING THE GaAs ROOM-TEMPERATURE INJECTION LASER AND THE GaAs ELECTRO-OPTIC CRYSTAL.**

W. J. Hannan and J. Bordogna (Radio Corporation of America, Defense Electronic Products, Applied Research Group, Camden, N.J.).

IN: DEFENSE ELECTRONIC PRODUCTS APPLIED RESEARCH. Camden, N.J., Radio Corporation of America, 1966, p. 2-7. 6 refs.

Description of the design of an experimental voice communications system using a GaAs room-temperature injection laser. The development of a TV communications system using very-high-resistivity GaAs crystals as practical modulators for laser beams at TV bandwidths is discussed, and modulation methods are compared. M.M.

**A67-11787****TRAVELING WAVE MASERS - A REVIEW.**

J. Vollmer (Radio Corporation of America, Defense Research Products, Applied Research Group, Camden, N.J.).

IN: DEFENSE ELECTRONIC PRODUCTS APPLIED RESEARCH.

Camden, N.J., Radio Corporation of America, 1966, p. 32-38.

Discussion of the use of chromium-doped rutile in a traveling wave maser (TWM). The TWM consists of a paramagnetic crystal (chromium doped rutile), a slow-wave circuit (a meander line), and a ferrite isolator. Topics discussed include: performance considerations, cryogenic systems, and stagger tuning. Prospects for the future are also considered.

M.M.

#### A67-11824

##### ELECTRON BEAM EXCITED LASERS MADE FROM SOLID SOLUTIONS OF $\text{GaP}_{1-x}\text{As}_x$

N. G. Basov, O. V. Bogdankevich, P. G. Eliseev, and B. M. Lavrushin (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(Fizika Tverdogo Tela, vol. 8, May 1966, p. 1341, 1342.)

Soviet Physics - Solid State, vol. 8, Nov. 1966, p. 1073, 1074.

Translation.

[For abstract see issue 17, page 2937, Accession no. A66-33304]

#### A67-11875

##### LASER INTERFEROMETER FOR REPETITIVELY PULSED PLASMAS.

E. B. Hooper, Jr. and G. Bekefi (Massachusetts Institute of Technology, Dept. of Physics and Research Laboratory of Electronics, Cambridge, Mass.).

Journal of Applied Physics, vol. 37, Oct. 1966, p. 4083-4094.

29 refs.

AEC-supported research.

A three-mirror laser interferometer for measuring electron densities in repetitively pulsed plasmas is described and analyzed. The instrument has a sensitivity equivalent to a density of  $10^{13}/\text{d cm}^{-3}$  where d is the length of the plasma in centimeters. It has a time resolution of a few microseconds. The response of the laser intensity to a changing dielectric (e.g., plasma) is calculated in the quasi-static approximation, and the factors contributing to the finite time response are considered. The analysis applies to laser interferometers in general, as well as to the present instrument.

(Author)

#### A67-11879

##### LASER SATURATION OF PHOTOCONDUCTIVITY AND DETERMINATION OF IMPERFECTION PARAMETERS IN SENSITIVE PHOTOCONDUCTORS.

Richard H. Bube and Ching-Tao Ho (Stanford University, Dept. of Materials Science, Stanford, Calif.).

Journal of Applied Physics, vol. 37, Oct. 1966, p. 4132-4138.

6 refs.

AEC-sponsored research.

Saturation of photoconductivity is a valuable technique in the determination of imperfection parameters in sensitive photoconductors. Measurements of saturation of photoconductivity using high-intensity excitation from a ruby laser have been made on a single crystal of  $\text{Cd}(\text{S}_{0.5}\text{Se}_{0.5})$ , selected for its band gap to give appreciable but approximately homogeneous excitation, as a function of temperature between 80 and 400°K. The density of sensitizing centers can be obtained directly from such measurements, together with information about the densities and depths of traps that influence the saturation process. For the crystal investigated, the density of sensitizing centers is  $7 \times 10^{15} \text{ cm}^{-3}$ . Knowledge of the density of sensitizing centers permits a direct determination of both photon absorption and electron-capture cross sections for these centers. Values obtained in this way are in good agreement with values independently determined.

(Author)

#### A67-11880

##### NEAR-ULTRAVIOLET AND VISIBLE RADIATION FROM A DYNAMIC PINCH.

I. Görög and J. R. Singer (California, University, Berkeley, Calif.).

Journal of Applied Physics, vol. 37, Oct. 1966, p. 4141-4147.

22 refs.

Contract No. DA-ARO(D)-31-124-G317; Grant No. AF AFOSR 117-63.

The utility of a magnetically compressed plasma as a high-intensity light source was experimentally investigated in a dynamic pinch. The motion of the confined plasma column was studied both experimentally and theoretically throughout a wide range of parameters. It was found that the peak intensity of the emitted light in the 2000-6000 Å spectral region is maximum when the plasma reaches minimum radius at times comparable to the quarter cycle period of the discharge current. When the parameters are adjusted to give this mode of operation, a single high-intensity pulse, lasting approximately  $2 \times 10^{-6}$  sec, is emitted. The peak intensity was greatest with xenon as the filling gas. The absolute intensity of the light emitted from helium, air, argon, and xenon plasmas was also measured. The results indicate that a dynamic pinch arrangement can be employed to obtain peak intensities significantly greater than those available from conventional flashlamps. The time-integrated intensity, however, is limited by the inherently unstable nature of the pinched plasma, which restricts the pulse duration to a few microseconds.

(Author)

#### A67-11891

##### TRANSITION PROBABILITIES BETWEEN LASER STATES IN CARBON DIOXIDE.

H. Statz (Raytheon Co., Research Div., Waltham, Mass.).

C. L. Tang (Cornell University, School of Electrical Engineering, Ithaca, N.Y.), and G. F. Koster (Massachusetts Institute of Technology, Dept. of Physics, Cambridge, Mass.).

Journal of Applied Physics, vol. 37, Oct. 1966, p. 4278-4284.

18 refs.

Radiative transition probabilities were investigated between certain vibrational levels of carbon dioxide. The number of levels studied was restricted to those that are directly or indirectly involved in the observed laser action. Vibrational wavefunctions were determined by diagonalizing large Hamiltonian matrices (up to  $30 \times 30$ ). In the Hamiltonian, nonlinear forces were included and the potential energy contained terms up to fourth order in the normal coordinates. The dipole moment as a function of the normal coordinates was determined, and reasonable agreement is obtained between theory and experiment for most transitions where experimental information is available. Radiative processes cannot account for relaxation times observed in laser action. Relaxation probably takes place during collisions with other molecules or light atoms. From gain measurements it is possible to determine the population difference between laser levels. In Q-switching experiments, half the energy stored in the upper maser state can be emitted in a short pulse. In thin tubes the energy content of a pulse can be  $10^{-5}$  joule/cm<sup>3</sup> of gas used.

(Author)

#### A67-11911

##### A TWO-FREQUENCY CAVITY RESONATOR WITH INDEPENDENT TUNING.

V. M. Sedykh.

(Radiotekhnika/Kiev, vol. 8, Sept.-Oct. 1965, p. 601, 602.)

Soviet Radio Engineering, vol. 8, Sept.-Oct. 1965, p. 451, 452.

Translation.

[For abstract see issue 08, page 1191, Accession no. A66-18918]

#### A67-12052

##### NONLINEAR EFFECTS PRODUCED BY RAMAN MASER RADIATIONS.

D. Madhavan, M. K. Dheer (Institute of Higher Technology, Dept. of Physics, Kanpur, India), and T. S. Jaseja (Birla Institute of Technology and Science, Pilani, India).

Applied Optics, vol. 5, Nov. 1966, p. 1823-1828, 13 refs.

A systematic study was made of the second harmonic generations (SHG) and the mixings of the Raman lines produced in cyclohexane, acetone, benzene, and carbon disulfide. In our experimental setup, the Raman cell was placed outside the optical cavity. The second harmonic of the first-order Stokes radiation was directly photographed. In the case of cyclohexane, the diameter of the focused second harmonic corresponded to an angular spread of about  $2$  or  $3 \times 10^{-2}$  rad. The power produced in the SHG was more than 1 kw. The spectrographic study shows that the SHG and the mixings of various Raman

lines are efficient. Their details are outlined in the case of individual liquids. In terms of cyclohexane, the SHG and the mixings of Raman emissions produced from the other molecular vibration ( $801\text{ cm}^{-1}$ ) are also observed. The reported observations indicate that the Stokes lines, beyond first order, produced in a forward direction with a threshold condition, are strong enough to show these nonlinear effects. (Author)

#### A67-12053 CHARACTERISTICS OF A $\lambda/2$ KERR CELL RUBY OSCILLATOR FOR USE AS AN OPTICAL RADAR (LIDAR).

Hans W. Mocker (Honeywell, Inc., Systems and Research Center, Minneapolis, Minn.).

*Applied Optics*, vol. 5, Nov. 1966, p. 1829-1831. 8 refs. USAF-supported research.

Description of a Q-switched ruby laser that is used as an optical radar for clear air turbulence (CAT) detection. The output consists of a single clean pulse of 35 Mw that is free of noise sources such as spontaneous emission, superradiance, and after-pulsing. The Q-switching performance of the laser is investigated for the half-wave and quarter-wave mode of operation as a function of pumping power and Kerr cell trigger delay. B.B.

#### A67-12054 VELOCITY ABERRATION AND ATMOSPHERIC REFRACTION IN SATELLITE LASER COMMUNICATION EXPERIMENTS.

L. J. Nugent (Oak Ridge National Laboratory, Chemistry Div., Oak Ridge, Tenn.) and R. J. Condon (Electro-Optical Systems, Inc., Pasadena, Calif.).

*Applied Optics*, vol. 5, Nov. 1966, p. 1832-1837. 8 refs.

The effects of satellite velocity aberration and atmospheric refraction on the direction of propagation of laser radiation reflected from a satellite back to an observer on the earth are examined. A velocity aberration analysis for the two-dimensional case where the satellite passes directly overhead at velocity  $v$  is presented to first order in  $v/c$  in order to illustrate the method. The equations for the more general three-dimensional case are then given to first order in  $v/c$ , and it is indicated that higher order treatments are normally unnecessary in typical experimental considerations. Following this, a simple approximate equation giving the atmospheric refraction to an accuracy of a few microradians is developed; it is indicated that greater accuracy is not important because of laser pointing limitations imposed by atmospheric scattering and turbulence. The atmospheric refraction equation depends only on the apparent zenith angle of the satellite reflector relative to the earth-based laser, on the satellite altitude, and on the index of refraction of the laser radiation in the atmosphere at the earth's surface. Both of these developments should be useful in the design and interpretation of satellite laser-communication experiments. (Author)

#### A67-12089 SELF-FOCUSING OF A LASER BEAM IN PLASMA.

A. R. M. Rashad (Memphis State University, School of Engineering Memphis, Tenn.).

IN: NATIONAL ELECTRONICS CONFERENCE, 22ND, CHICAGO, ILL., OCTOBER 3-5, 1966, PROCEEDINGS. [A67-12086 02-07]

Conference sponsored by the Illinois Institute of Technology, the Institute of Electrical and Electronics Engineers Region IV, Northwestern University, and the University of Illinois. Chicago, National Electronics Conference, Inc., 1966, p. 19-24. 18 refs.

The conditions under which a laser beam can be propagated through a plasma, without spreading by diffraction - i.e., when it is self-focused - are analyzed in detail. The resulting nonlinear wave equation is solved for the case of a slab-shaped beam and for the case of a cylindrical beam configuration. The plasma absorption mechanisms of the laser energy are evaluated and discussed. (Author)

#### A67-12096

##### SCATTERING OF PARTIALLY COHERENT RADIATION IN NEUTRAL GAS.

G. J. Gabriel (Notre Dame, University, Dept. of Electrical Engineering, Notre Dame, Ind.).

IN: NATIONAL ELECTRONICS CONFERENCE, 22ND, CHICAGO, ILL., OCTOBER 3-5, 1966, PROCEEDINGS. [A67-12086 02-07]

Conference sponsored by the Illinois Institute of Technology, the Institute of Electrical and Electronics Engineers Region IV, Northwestern University, and the University of Illinois. Chicago, National Electronics Conference, Inc., 1966, p. 56-60. 7 refs.

Explanation of the scattering of partially coherent radiation by neutral molecules. Scattering is formulated as a random process. The problem is stated in the general form of radiation from a distribution of dipoles whose moment density  $P(r, t)$  is a random function of space and time. The fundamental hypothesis is stated analytically as a logical consequence of this formulation. An idealized one-dimensional representation is considered to demonstrate the agreement of the theory with experimental data. Fluctuations of the wave, as well as those of density, are assumed to be contributory to the scattered field. W. A. E.

#### A67-12179

##### ENERGY BEAMS AS WORKING TOOLS.

Maurice Nelles (Westinghouse Electric Corp., Baltimore, Md.).

IN: NATIONAL ELECTRONICS CONFERENCE, 22ND, CHICAGO, ILL., OCTOBER 3-5, 1966, PROCEEDINGS. [A67-12086 02-07]

Conference sponsored by the Illinois Institute of Technology, the Institute of Electrical and Electronics Engineers Region IV, Northwestern University, and the University of Illinois. Chicago, National Electronics Conference, Inc., 1966, p. 991, 992.

Consideration of lasers and their application to manufacturing technology, of recent innovations in electron beam technology, and of new developments in the use of focused plasma beams. The pulsed laser is a well-collimated high-power light source, and is well-suited for welding of microcircuit components. It is expensive, however, and high powers are not at present available in continuous energy output. Attention is given to recently built solar simulators using xenon and xenon-mercury high pressure short-arc lamps. Improved electron beam welders create the beam in a vacuum, and the beam can be brought outside the vacuum chamber to be used directly on the work piece. F. R. L.

#### A67-12180

##### PARTICLE EMISSION IN LASER-SURFACE INTERACTIONS.

J. F. Ready, E. Bernal, and L. P. Levine (Honeywell, Inc., Research Center, Hopkins, Minn.).

IN: NATIONAL ELECTRONICS CONFERENCE, 22ND, CHICAGO, ILL., OCTOBER 3-5, 1966, PROCEEDINGS. [A67-12086 02-07]

Conference sponsored by the Illinois Institute of Technology, the Institute of Electrical and Electronics Engineers Region IV, Northwestern University, and the University of Illinois. Chicago, National Electronics Conference, Inc., 1966, p. 993-998. 8 refs.

Army-supported research.

Consideration of the particle-emission aspects of laser-surface interactions at relatively low powers per unit area in the laser beam. In the range studied (below  $100\text{ Mw/cm}^2$ ), a single laser pulse does only small damage to the surface, removing material to a depth of the order of  $10^{-6}\text{ cm}$ . It was found that even at these relatively low laser powers, copious emission of high energy particles occurred. The particles contain both ions and neutral molecules with energies of the order of 100 ev and consist mainly of adsorbed surface species. In addition, a larger amount of neutral gas is thermally desorbed. F. R. L.

#### A67-12227 #

##### HIGH-SPEED SCHLIEREN PHOTOGRAPHY USING A KERR CELL MODULATED LASER LIGHT SOURCE.

Gerald B. Steel.

*AIAA Student Journal*, vol. 4, Oct. 1966, p. 82-85. 6 refs. Grant No. AF AFOSR 129-65.

Description of a laser light source controlled by a Kerr cell, where the source has been coupled with a Z-type schlieren optical system to produce multiple flash photographs of the development of a detonation wave. The laser provides an intense, coherent, parallel, polarized, monochromatic beam of light that is pulsed on and off by a Kerr cell placed in the laser cavity. In this case, the camera serves only to displace successive images over the film at a rate sufficient to avoid image overlap. The system described is capable of 10<sup>-8</sup>-sec exposures at a rate of 10<sup>6</sup>/sec and was developed specifically to take schlieren photographs of the development of detonation in explosive gas mixtures. However, it can be adapted easily to take direct-image, interferometer, or shadow photographs of various processes.

M. F.

**A67-12241 #**

PRINCIPAL FORMS OF DISINTEGRATION OF ORGANIC GLASS UNDER THE EFFECT OF PULSED LASER BEAMS [OSNOVNYE VIDY RAZRUSHENIIA ORGANICHESKOGO STEKLA PRI VOZDEISTVII IMPUL'SNYKH SVETOVYKH LUCHEI LAZERA].

L. I. Mirkin and N. F. Filipetskii (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR).

*Mekhanika Polimerov*, no. 4, 1966, p. 624, 625. In Russian.

Investigation of the effect of pulsed laser beams on (highly transparent) Plexiglas samples in the form of 60-by-25-by-25-mm rectangular prisms and 16-mm cylinders varying in length from 30 to 65 mm. An analysis of several dozen samples revealed two principal types of disintegration. In the case of lenses of large focal length, disintegration proceeds over the entire sample; the mechanism consists in the formation of fine nearly spherical pores. In the case of short focal length, the mechanism of disintegration is formation of nearly flat cracks. Other parameters of the system do not seem to have an appreciable effect on the type of disintegration. Some peculiar features revealed in the microanalysis of both disintegration types are noted.

V. P.

**A67-12243**

APPLICATIONS OF LASERS TO PHOTO-OPTICAL INSTRUMENTATION PROBLEMS.

Robert L. Leighton (United Aircraft Corp., Research Laboratories, East Hartford, Conn.).

(Society of Photo-optical Instrumentation Engineers, Technical Symposium, 10th, San Francisco, Calif., Aug. 16-20, 1965, Paper.) *SPIE Journal*, vol. 4, Aug.-Sept. 1966, p. 263-266.

A number of recent applications of lasers to the solution of photooptical instrumentation problems are described. These include analytical and experimental studies performed to evaluate the use of both pulsed solid-state and CW gas lasers as light sources for schlieren and interferometer systems, the application of a CW gas laser and a high-speed camera to investigate dynamic acoustic pressure waves and the investigation of a laser source for a backscattering photometer for measuring light transmission through the atmosphere. Each application described serves to illustrate one or more of the laser's unique properties in meeting a particular photooptical instrumentation requirement.

(Author)

**A67-12421 #**

THEORY OF A TWO-PHOTON LASER [K TEORII DVUKHFOTONNOGO LAZERA].

T. M. Il'inova (Moskovskii Gosudarstvennyi Universitet, Kafedra Fiziki Kolebaniy, Moscow, USSR).

*Moskovskii Universitet, Vestnik, Seriya III - Fizika, Astronomiia*, vol. 21, July-Aug. 1966, p. 79-87. 6 refs. In Russian.

Derivation of the equations describing nonsteady processes in a two-photon laser. The conditions of self-excitation of such processes are derived in an approximation of the given field. It is shown that when the second effective level is metastable, a field with a difference frequency can be excited even in the absence of an initial population inversion difference if the field from the external coherent source exceeds a certain threshold value. The steady-state conditions and the stability of the two-photon laser are investigated.

A. B. K.

**A67-12423 #**

MODULATION OF THE Q-FACTOR OF A RUBY LASER WITH THE AID OF SATURATING FILTERS BASED ON PHTHALOCYANINE SOLUTIONS [MODULATSIIA DOBROTNOSTI RUBINOVOGO LAZERA S POMOSHCH'IU NASYSHCHAIUSHCHIKHSIA FIL'TROV NA OSNOVE RASTVOROV FTALOTSIANINOV].

I. V. Nizhegorodova, V. V. Fadeev, E. M. Shvom, and L. P. Shklover (Moskovskii Gosudarstvennyi Universitet, Kafedra Volnovykh Protessov, Moscow, USSR).

*Moskovskii Universitet, Vestnik, Seriya III - Fizika, Astronomiia*, vol. 21, July-Aug. 1966, p. 103-105. 6 refs. In Russian.

Results of an experimental study of a ruby laser with a liquid filter. The relation between the efficiency of the filter as a laser Q-factor modulator and the parameters of its absorption curve is considered, as well as the dynamics of the development of a giant pulse in a laser with such a filter, and the choice of the optimal parameters of a laser with this filter. The results of tests of solutions of vanadyl, chloraluminum, and zirconium phthalocyanines in nitrobenzene, benzyl alcohol, toluene, carbon tetrachloride, and ethyl alcohol are cited.

A. B. K.

**A67-12451**

LASER-INDUCED BREAKDOWN OF ORGANIC VAPORS.

Albert H. Adelman (Battelle Memorial Institute, Columbus Laboratories, Columbus, Ohio).

*Journal of Chemical Physics*, vol. 45, Oct. 15, 1966, p. 3152-3153. 13 refs.

Investigation of laser-induced breakdown of complex organic molecules in a vapor state and their ensuing reactions. The emission accompanying the breakdown of carbon tetrachloride, chloroform, acetone, methanol, and hexane is described, and some of the resultant products are identified. Breakdown of these compounds apparently results in a hot gas which is at least partially dissociated. The breakdown thresholds are tabulated. The short duration of the exciting pulse suggests that laser excitation could be used in the study of kinetics, especially in relaxation studies.

W. A. E.

**A67-12481 #**

SELF-FOCUSING OF LIGHT IN NaCl CRYSTALS [SAMOFOKUSUVANNIA SVITLA V KRISTALAKH NaCl].

M. S. Brodin, V. M. Vatul'ov, and O. M. Kamuz (Akademiia Nauk Ukrain'skoi RSR, Institut Fiziki, Kiev, Ukrainian SSR).

*Ukrains'kii Fizichnii Zhurnal*, vol. 11, Oct. 1966, p. 1151-1153. 6 refs. In Ukrainian.

Experimental proof for self-focusing of a ruby laser beam in a NaCl crystal, a phenomenon previously observed in glass by Hercher and in fluids by Pilipetskii and Rustamov. The experimental technique is described and photographs of constrained laser beam traces in NaCl crystals at 77°K are given.

V. Z.

**A67-12503**

SELF-LOCKING OF MODES IN THE ARGON ION LASER.

O. L. Gaddy and E. M. Schaefer (Illinois, University, Dept. of Electrical Engineering, Urbana, Ill.).

*Applied Physics Letters*, vol. 9, Oct. 15, 1966, p. 281, 282. USAF-sponsored research.

Direct observation of indications of self-mode-locking in the argon ion laser is reported. With losses introduced into the optical resonator, subnanosecond pulsation of the laser output is observed with a wide-band photomultiplier.

(Author)

**A67-12506**

OPTICAL FREQUENCY TRANSLATION OF MODE-LOCKED LASER PULSES.

M. A. Duguay, L. E. Hargrove, and K. B. Jefferts (Bell Telephone Laboratories, Inc., Murray Hill, N. J.).

*Applied Physics Letters*, vol. 9, Oct. 15, 1966, p. 287-290. 10 refs.

Optical frequency translation of pulses from a mode-locked laser is described and demonstrated experimentally. The laser beam is passed through a crystal of LiNbO<sub>3</sub> whose refractive index is made to change sinusoidally at the mode-locked laser round-trip frequency (56 Mc). A Doppler shift of the laser light results. Shifts of  $\pm 2.4$  Gc have been observed. The scheme may be capable of producing shifts as large as  $\pm 1000$  Gc.

(Author)

**A67-12508**

ON THE DYNAMICS OF LASER-INDUCED DAMAGE IN GLASSES.  
J. P. Budin and J. Raffy (Compagnie Général d'Electricité de Paris, Centre de Recherches, Département Recherches Physiques de Base, Marcoussis, Seine-et-Oise, France).

Applied Physics Letters, vol. 9, Oct. 15, 1966, p. 291-293. 9 refs. Research supported by the Commissariat à l'Energie Atomique and the Direction des Recherches et Moyens d'Essais.

The evolution in time of laser-induced fractures in bulk transparent materials such as glass is studied. Damage starts with a long, thin filament, collinear with the laser beam direction, almost simultaneously over its whole length. Damage then grows transversally to this direction, after the end of the incident laser pulse, and is accompanied by sparking. These observations favor damage mechanisms with short time constants such as ionization or self-trapping.

(Author)

**A67-12510**

NO MOLECULAR LASER.

Thomas F. Deutsch (Raytheon Co., Research Div., Waltham, Mass.).  
Applied Physics Letters, vol. 9, Oct. 15, 1966, p. 295-297.

8 refs.

Laser action on over sixty vibrational-rotational transitions in the ground electronic state of nitric oxide is obtained by the dissociation of NOCl in a pulsed electrical discharge. The emission occurs between 5.84 and 6.43  $\mu$ . The observed frequencies are fitted using the revised vibrational constants  $\omega_e = 1904.01 \text{ cm}^{-1}$  and  $\omega_e x_e = 13.995 \text{ cm}^{-1}$ .

(Author)

**A67-12513**

COPYING HOLOGRAMS.

M. J. Landry (Sandia Corp., Albuquerque, N. Mex.).

Applied Physics Letters, vol. 9, Oct. 15, 1966, p. 303, 304.

AEC-supported research.

A method is described by which particularly good copies of holograms can be made. The reconstructed images formed by copies made when a He-Ne laser is used as the illuminating light for the copying process are excellent in detail and are less degraded than when other conventional illuminating light source is used.

(Author)

**A67-12515**

ORGANIC DYE SOLUTION LASER.

Fritz P. Schäfer, Werner Schmidt, and Jürgen Volze (Marburg, Universität, Physikalisches-Chemisches Institut, Marburg an der Lahn, West Germany).

Applied Physics Letters, vol. 9, Oct. 15, 1966, p. 306-309.

Research supported by the Deutsche Forschungsgemeinschaft.

The operation and characteristics of liquid lasers with a purely organic medium are described. A giant-pulse ruby laser is used to pump solutions of organic dyes in various organic solvents in concentrations ranging from  $10^{-3}$  to  $10^{-6}$  moles/liter. The solutions are contained in plane-parallel cuvettes acting as laser cavities. Wavelengths from 730 to 870 nm, megawatt peak powers and beam divergence angles of 5 mrad have been observed. The laser wavelength of each dye is tunable over a great part of its fluorescence band - e.g., by a change in concentration.

(Author)

**A67-12516**

PERFORMANCE OF A VIBRATIONAL  $H_2$ -STOKES OSCILLATOR.

P. V. Avizonis, A. H. Guenther (USAF, Systems Command, Research and Technology Div., Weapons Laboratory, Kirtland AFB, N. Mex.), T. A. Wiggins, R. V. Wick, and D. H. Rank (Pennsylvania State University, Dept. of Physics, University Park, Pa.).  
Applied Physics Letters, vol. 9, Oct. 15, 1966, p. 309-311. 8 refs. ARPA-supported research.

An  $H_2$ -Stokes Raman oscillator was constructed operating at 9755 Å, and its performance was found to be as expected of laser oscillators. No beam instability was developed (beam trapping), confirming earlier measurements. A significant beam brightness enhancement (in terms of line width and beam divergence) over that of the Q-switched ruby laser resulted.

(Author)

**A67-12517**

CONTINUOUSLY-VARIABLE ULTRASONIC-OPTICAL DELAY LINE.

M. J. Brienza and A. J. DeMaria (United Aircraft Corp., Research Laboratories, East Hartford, Conn.).

Applied Physics Letters, vol. 9, Oct. 15, 1966, p. 312-314. 10 refs. Navy-supported research.

Experimental results are reported on a continuously-variable delay line using acoustic waves to diffract and frequency-shift a portion of an argon ion laser beam. Data were obtained from 300 to 700 MHz utilizing thin-film CdS transducers deposited on a single-crystal Z-cut quartz rod placed within the laser cavity. The diffracted, frequency-shifted beam was optically heterodyned on a p-i-n detector. Variable delays of the order of 10  $\mu$ sec were obtained by varying the distance from the CdS transducer to the beams' intercept point. A novel folded-acoustic path configuration is also described.

(Author)

**A67-12520**

DIRECT ELECTRON EXCITATION CROSS SECTIONS PERTINENT TO THE ARGON ION LASER.

W. R. Bennett, Jr., G. N. Mercer, P. J. Kindlmann, B. Wexler, and H. Hyman (Yale University, Sloane and Dunham Laboratories, New Haven, Conn.).

Physical Review Letters, vol. 17, Nov. 7, 1966, p. 987-991. 14 refs. USAF-Army-supported research.

Absolute direct excitation cross sections from the neutral ground state have been measured for upper levels of the strongest laser transitions in Ar II to within errors of  $\approx 20\%$ . Reasonable agreement is obtained with calculated values of these cross sections based on the "sudden" approximation made by Koozeckani with Hartree-Fock wave functions and intermediate coupling.

(Author)

**A67-12524**

OPTICAL NONLINEARITIES DUE TO MOBILE CARRIERS IN SEMICONDUCTORS.

C. K. N. Patel, R. E. Slusher, and P. A. Fleury (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

Physical Review Letters, vol. 17, Nov. 7, 1966, p. 1011-1014. 11 refs.

Investigation of optical nonlinearities caused by conduction-band electrons in InAs, InSb, GaAs, and PbTe. A Q-switched  $CO_2$  laser generating 10.6- $\mu$  ( $\omega_1$ ) and 9.6- $\mu$  ( $\omega_2$ ) radiation was used in the study. The difference frequencies  $\omega_3 = 2\omega_1 - \omega_2$  at 11.8  $\mu$  and  $\omega_4 = 2\omega_2 - \omega_1$  at 8.7  $\mu$  were measured for a variety of carrier concentrations at several temperatures.

W.A.E.

**A67-12525**

THEORY OF OPTICAL MIXING BY MOBILE CARRIERS IN SEMICONDUCTORS.

P. A. Wolff and Gary A. Pearson (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

Physical Review Letters, vol. 17, Nov. 7, 1966, p. 1015-1017. 7 refs.

Formulation of a theory of optical mixing by mobile carriers in semiconductors. The nonlinearities of a classical plasma (one with a parabolic energy-momentum relation for the carriers) are far too weak to explain the observed mixing. It is proposed that the observed nonlinearity is caused by nonparabolicity of the conduction band, an effect which is known to be relatively large in crystals such as InAs and InSb.

W.A.E.

**A67-12634**

COHERENCE AND STATISTICAL PROPERTIES OF A TWO-MODE LASER BEAM.

M. Bertolotti, B. Crosignani, P. Di Porto, and D. Sette (Fondazione Università Bordini, Istituto Superiore P.T.; Roma, Università, Istituto di Fisica, Rome, Italy).

Physical Review, 2nd Series, vol. 150, Oct. 28, 1966, p. 1054-1059. 14 refs.

Research supported by the Consiglio Nazionale delle Ricerche.

The first- and second-order correlation functions for the field obtained by the superposition of two laser modes through a Young's experiment are discussed both experimentally and theoretically. An



electronic method we have developed for measuring certain values of the second-order correlation is contrasted with the method based on photon counting. It is shown that, in some cases, interference experiments may have advantages over the photocounting technique. (Author)

**A67-12688****INTERFEROMETER FOR SHOCK TUBE.**

Arthur L. Besse (Stevens Institute of Technology, Hoboken, N. J.) and Joseph G. Kelley (USAF, Office of Aerospace Research, Cambridge Research Laboratories, Bedford, Mass.).  
Review of Scientific Instruments, vol. 37, Nov. 1966, p. 1497-1499. 18 refs.

USAF-sponsored research; Contract No. AF 19(628)-2398.

A Twyman-Green arrangement with a narrow laser beam and twin photomultipliers is used to obtain positive indication of the direction of fringe movement, resolution of 1/12 of a fringe, and good discrimination against shock induced radiation. The instrument has been successfully applied to the study of ionization behind strong argon shocks. (Author)

**A67-12742 #****LOSSES IN SOLID-STATE LASERS DURING LASER ACTION [O POTERIAKH OKG NA TVERDOM TELE V PROTSESSE GENERATSII].**

V. I. Lebedev and V. A. Pilipovich (Akademiia Nauk Belorusskoi SSR, Institut Fiziki, Minsk, Belorussian SSR).  
Akademiia Nauk BSSR, Doklady, vol. 10, Sept. 1966, p. 644-646. 12 refs. In Russian.

Measurement with a high speed photorecorder of variations in the divergence angle of a ruby laser beam and variations in the laser spot diameter on the sample end. The results are used to determine harmful losses in the radiation of a ruby laser. The theoretical background of this method is set forth. V. Z.

**A67-12812 #****LASER ACTION IN Cds BY ELECTRON BOMBARDEMENT [EFFET LASER DANS LE Cds PAR BOMBARDEMENT ELECTRONIQUE].**

C. Benoit à la Guillaume and J.-M. Debever (Paris, Université, Ecole Normale Supérieure, Laboratoire de Physique, Paris, France).  
(Académie des Sciences (Paris), Comptes Rendus, vol. 261, no. 25, Dec. 20, 1965, p. 5428-5430; Institute of Electrical and Electronics Engineers, Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)  
Physica Status Solidi, vol. 17, no. 2, 1966, p. 875-879. 6 refs. In French.

[For abstract see issue 08, page 1233, Accession no. A66-18650]

**A67-12855 #****A STUDY OF THE EMISSION CHARACTERISTICS OF A RUBY LASER.**

M. P. Lisitsa, N. R. Kulish, A. M. Iaremko, P. M. Koval', and V. I. Geets.  
(Optika i Spektroskopiia, vol. 21, July 1966, p. 76-81.)  
Optics and Spectroscopy, vol. 21, July 1966, p. 41-44. 10 refs. Translation.

[For abstract see issue 22, page 3930, Accession no. A66-39769]

**A67-12856 #****ON THE POSSIBILITY OF USING INDUCED TWO-QUANTUM LUMINESCENCE FOR THE PRODUCTION OF POWERFUL COHERENT RADIATION.**

A. S. Selivanenko.  
(Optika i Spektroskopiia, vol. 21, July 1966, p. 100, 101.)  
Optics and Spectroscopy, vol. 21, July 1966, p. 54. Translation.  
[For abstract see issue 22, page 3930, Accession no. A66-39771]

**A67-12928****STATISTICAL EFFECTS CONNECTED WITH THE GENERATION OF OPTICAL HARMONICS.**

S. A. Akhmanov, A. I. Kovrigin, A. S. Chirkin, and O. N. Chunaev (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR).  
(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 50, Apr. 1966, p. 829-843.)  
Soviet Physics - JETP, vol. 23, Oct. 1966, p. 549-558. 25 refs. Translation.

[For abstract see issue 16, page 2747, Accession no. A66-31167]

**A67-12941****GENERATION DYNAMICS OF A GIANT COHERENT LIGHT PULSE.**

V. S. Letokhov and A. F. Suchkov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).  
(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 50, Apr. 1966, p. 1148-1155.)  
Soviet Physics - JETP, vol. 23, Oct. 1966, p. 763-767. 16 refs. Translation.

[For abstract see issue 16, page 2719, Accession no. A66-31183]

**A67-12964****AVALANCHE TRANSISTORS DRIVE LASER DIODES HARD AND FAST.**

Herman E. Brown (Texas, University, Defense Research Laboratory, Electro-Optic Development Section, Austin, Tex.), Robert A. Bond (Texas, University, Defense Research Laboratory, Military Physics Div., Electronic Section, Austin, Tex.), and James C. Bloomquist (USAF, Systems Command, Research and Technology Div., Armament Laboratory, Missiles Branch, Eglin AFB, Fla.).  
Electronics, vol. 39, Nov. 14, 1966, p. 137-139.

USAF-supported research.

Description of a pulser circuit, specifically designed to drive gallium-arsenide laser diodes, which produces high-current pulses of extremely short duration and fast rise time. It uses the avalanche mode of operation in silicon epitaxial annular transistors. If a high enough voltage is applied to the collector, avalanche multiplication of carriers will occur in the depletion region. The transistor becomes a low-resistance, fast electronic switch, capable of providing short duration, high-current pulses. F.R.L.

**A67-13094 #****METHOD FOR MEASURING LASER FREQUENCY VARIATIONS [OB ODNOM METODE IZMENENIIA CHASTOTY OPTICHESKIKH KVANTOVYKH GENERATOROV].**

G. V. Krivoshchekov, Iu. M. Kirin, S. I. Marennikov, G. A. Savvinykh, and V. I. Dotsenko (Akademiia Nauk SSSR, Sibirskoe Otdelenie, Institut Fiziki Poluprovodnikov, Novosibirsk, USSR).  
Akademiia Nauk SSSR, Sibirskoe Otdelenie, Izvestiia, Seria Tekhnicheskikh Nauk, no. 2, 1966, p. 155, 156. 8 refs. In Russian.

Brief description of a technique for ruby-laser frequency conversion by scattering the laser beam in benzene followed by mixing the combined frequencies in  $\text{NH}_4\text{H}_2\text{PO}_4$ . Coherent radiation is proved possible over the entire optical range. A diagram of the experimental setup with an aqueous  $\text{CuSO}_4$  filter is given. V. Z.

**A67-13095 #****GENERATION FROM TWO R-LINES OF A RUBY [GENERATSIIA RUBINA NA DVUKH R-LINIIAKH].**

V. N. Ishchenko and V. N. Lisitsyn (Akademiia Nauk SSSR, Sibirskoe Otdelenie, Institut Fiziki Poluprovodnikov, Novosibirsk, USSR).

Akademiia Nauk SSSR, Sibirskoe Otdelenie, Izvestiia, Seria Tekhnicheskikh Nauk, no. 2, 1966, p. 156-158. 6 refs. In Russian.

Description of a technique using a light dispersing prism in a resonator to produce laser action at the  $R_1$  and  $R_2$  lines in a ruby laser. The experimental optical system, having two F-1 glass prisms with refraction angles of  $60^\circ$  inserted in the resonator, is shown in a diagram. Oscillograms of the obtained emission are also given. V. Z.

**A67-13096 #**

REGENERATIVE RADIATION FROM THE 6328-Å LINE OF A DISCHARGE IN A He-Ne MIXTURE [REGENERATIVNOE IZLUCHENIE NA LINII 6328 V RAZRIADE V SMESI He-Ne].

V. P. Chebotaev (Akademiia Nauk SSSR, Sibirskoe Otdelenie, Institut Fiziki Poluprovodnikov, Novosibirsk, USSR).

Akademiia Nauk SSSR, Sibirskoe Otdelenie, Izvestiia, Seriya Tekhnicheskikh Nauk, no. 2, 1966, p. 158, 159. In Russian.

Brief note on an investigation of the radiation from the 6328 Å neon line produced in an He-Ne laser using spherical mirrors with a 2000-mm radius of curvature and a space of about 2000 mm between the mirrors. The interferential rings obtained with a 30-mm Fabry-Pérot etalon are shown in a photograph. V. Z.

**A67-13117 #**

DENSITY OF HEAT SOURCES AND THE TEMPERATURE FIELD IN A RUBY LASER CRYSTAL [PLOTNOST' ISTOCHNIKOV TEPLA I TEMPERATURNOE POLE V KRISTALLE RUBINOVOGO OKG]. A. V. Khromov and Iu. V. Libin.

Inzhenerno-Fizicheskii Zhurnal, vol. 11, Oct. 1966, p. 526-531. 6 refs. In Russian.

Calculation of the volume density of heat sources in a ruby laser rod by numerical integration of the pumping and absorption spectra. An approximate formula is derived for the density of heat sources, with the help of which the temperature field in the crystal for typical modes of pumping and cooling is determined. S. Z.

**A67-13124**

QUANTUM ELECTRONICS [KVANTOVAIA ELEKTRONIKA].

Edited by M. P. Lisitsa (Akademiia Nauk Ukrainskoi SSR, Institut Poluprovodnikov, Kiev, Ukrainian SSR).

Kiev, Izdatel'stvo Naukova Dumka, 1966. 347 p. In Russian.

**CONTENTS:**

NONLINEAR OPTICAL EFFECTS AND SPATIAL DISPERSION IN CRYSTALS [NELINEIYNE OPTICHESKIE EFFEKTY I PROSTRANSTVENNAIA DISPERSIYA V KRISTALLAKH]. V. S. Mashkevich (Akademiia Nauk Ukrainskoi SSR, Kiev, Ukrainian SSR), p. 3-12. 5 refs. [See A67-13125 03-16]

THEORY OF NONLINEAR OPTICAL PHENOMENA IN IMPURITY SEMICONDUCTORS [TEORIYA NELINEIYNYKH OPTICHESKIKH IAVLENII V PRIMESNYKH POLUPROVODNIKAKH]. V. I. Ponomarenko (Akademiia Nauk Ukrainskoi SSR, Kiev, Ukrainian SSR), p. 13-33. 6 refs. [See A67-13126 03-16]

THE KINETIC-EQUATION METHOD IN THE THEORY OF GENERATION OF OPTICAL HARMONICS [METOD KINETICHESKIKH URAVNENII V TEORII GENERATSII OPTICHESKIKH GARMONIK]. I. A. Marushko and V. S. Mashkevich (Akademiia Nauk Ukrainskoi SSR, Kiev, Ukrainian SSR), p. 34-76. 20 refs. [See A67-13127 03-16]

CERTAIN EFFECTS OF THE INTERACTION BETWEEN A RUBY LASER BEAM AND "TRANSPARENT" CRYSTALS [NEKOTORYE EFFEKTY VZAIMODEISTVIA PUCHKA RUBINOVOGO LAZERA S "PROZRACHNYMI" KRISTALLAMI]. M. S. Brodin, V. N. Vatulov, S. V. Zakrevskii, and A. M. Kamuz (Akademiia Nauk Ukrainskoi SSR, Kiev, Ukrainian SSR), p. 77-90. 24 refs. [See A67-13128 03-16]

STUDY OF CERTAIN LASER PARAMETERS [ISSLEDOVANIE NEKOTORYKH PARAMETROV OPTICHESKIKH KVANTOVYKH GENERATOROV]. M. P. Lisitsa, A. M. Iaremko, and N. R. Kulish (Akademiia Nauk Ukrainskoi SSR, Kiev, Ukrainian SSR), p. 91-106. 8 refs. [See A67-13129 03-16]

LINEAR PHASE DISTORTIONS OF A RESONATOR AND GENERATION OF INDUCED EMISSION IN A RUBY CRYSTAL [LINEIYNE FAZOVYE ISKAZHENIYA REZONATORA I GENERATSIIA INDITSIROVANNOGO IZLUCHENIYA NA KRISTALLE RUBINA]. M. S. Soskin (Akademiia Nauk Ukrainskoi SSR, Kiev, Ukrainian SSR), p. 107-122. 29 refs. [See A67-13130 03-16]

A LASER WITH A TUNABLE FREQUENCY [OPTICHESKII KVANTOVYI GENERATOR S PERESTRAIVAE MOI CHASTOTOI]. V. L. Broude and M. S. Soskin (Akademiia Nauk Ukrainskoi SSR, Kiev, Ukrainian SSR), p. 123-136. 26 refs. [See A67-13131 03-16]

UNCOUPLED INTENSITY PEAKS IN LASER EMISSION [NE-SVIAZANNYIE PIKI INTENSIVNOSTI V IZLUCHENII LAZERA].

A. M. Ratner, I. A. Rom-Krichevskaya, and Iu. A. Tiunov (Akademiia Nauk Ukrainskoi SSR, Kharkov, Ukrainian SSR), p. 137-143. [See A67-13132 03-16]

STUDY OF LASER LOSSES AND ASSOCIATED EMISSION CHARACTERISTICS [ISSLEDOVANIE POTER' I SVIAZANNYKH S NIMI KHARAKTERISTIK IZLUCHENIYA LAZERA]. N. L. Kramarenko, A. V. Meshcheriakov, Iu. V. Naboikin, A. M. Ratner, and I. A. Rom-Krichevskaya (Akademiia Nauk Ukrainskoi SSR, Kharkov, Ukrainian SSR), p. 144-149. 6 refs. [See A67-13133 03-16]

RADIATION CHARACTERISTICS OF A LASER IN THE STATIONARY STATE AND DURING RELAXATION [KHARAKTERISTIKI IZLUCHENIYA LAZERA V STATSIONARNOM REZHIME I V PROTSESSE RELAKSATSII]. A. M. Ratner (Akademiia Nauk Ukrainskoi SSR, Kharkov, Ukrainian SSR), p. 150-165. 11 refs. [See A67-13134 03-16]

LASER Q-FACTOR MODULATION WITH THE AID OF NON-LINEAR EFFECTS IN ABSORBING MEDIA [MODULIATSIIA DOBROTNOSTI LAZERA S POMOSHCH'U NELINEIYNYKH EFFEKTOV V POGLOSHCHAIUSHCHIKH SREDAKH]. A. M. Ratner (Akademiia Nauk Ukrainskoi SSR, Kharkov, Ukrainian SSR), p. 166-182. 10 refs. [See A67-13135 03-16]

REABSORPTION OF RADIATION ON EXCITED LEVELS AND THE POSSIBILITY OF ACHIEVING LIGHT GENERATION [REABSORBSIIA IZLUCHENIYA NA VOZBUZHDENNYKH UROVNIYAKH I VOZMOZHNOST' OSUSHCHESTVLENIIA GENERATSII SVETA]. Iu. V. Naboikin, L. A. Ogurtsova, and I. D. Fil' (Akademiia Nauk Ukrainskoi SSR, Kharkov, Ukrainian SSR), p. 183-187.

LUMINESCENCE DURING INTENSIVE EXCITATION [LIUMINISTSENTSIYA PRI INTENSIVNOM VOZBUZHDENII]. V. L. Broude and E. F. Sheka (Akademiia Nauk Ukrainskoi SSR, Kiev, Ukrainian SSR), p. 188-213. 15 refs. [See A67-13136 03-16]

THEORY OF LASER RADIATION INDUCED BY IMPURITY-BAND TRANSITIONS [TEORIYA LAZERNOGO IZLUCHENIYA NA PRIMESNOZONNYKH PEREKHODAKH]. V. L. Vinetskii, N. N. Kolychev, and V. S. Mashkevich (Akademiia Nauk Ukrainskoi SSR, Kiev, Ukrainian SSR), p. 214-227. 7 refs. [See A67-13137 03-16]

REVIEW OF EXTERNAL SUPERHIGH-FREQUENCY MODULATION TECHNIQUES FOR LASERS [OBSORZ METODOV VNESHNEI SVERKHVYSOKOCHASTOTNOI MODULIATSII OPTICHESKIKH KVANTOVYKH GENERATOROV]. I. A. Deriugin, I. P. Pugach, and A. A. Solomko (Kievskii Gosudarstvennyi Universitet, Kiev, Ukrainian SSR), p. 228-258. 48 refs. [See A67-13138 03-16]

NOISES OF QUANTUM DEVICES [SHUMY KVANTOVYKH USTROISTV]. I. A. Deriugin (Kievskii Gosudarstvennyi Universitet, Kiev, Ukrainian SSR), p. 259-291. 26 refs. [See A67-13139 03-16]

QUANTUM EFFECTS IN INFORMATION-TRANSMISSION SYSTEMS [KVANTOVYE EFFEKTY V SISTEMAKH PEREDACHI INFORMATSII]. I. A. Deriugin and V. N. Kurashov (Kievskii Gosudarstvennyi Universitet, Kiev, Ukrainian SSR), p. 292-319. 17 refs. [See A67-13140 03-07]

LIGHT ABSORPTION BY URANIUM GLASS IN AN EXCITED STATE [POGLOSHCHENIE SVETA URANOVYM STEKLOM V VOZBUZHDENNOM SOSTOIANII]. V. A. Kaplun, Iu. V. Naboikin, Iu. A. Pereverzev, and K. T. Pechii, p. 320, 321. [See A67-13141 03-16]

USE OF LASERS FOR STUDYING THE KINETICS OF AUTO-PHOTOELECTRONIC EMISSION [PRIMENENIE OKG DLIA ISSLEDOVANIIA KINETIKI AVTOFOTOELEKTRONNOI EMISSII]. A. F. Iatsenko, Iu. A. Kuliupin, and B. V. Stetsenko (Akademiia Nauk Ukrainskoi SSR, Kiev, Ukrainian SSR), p. 322-326. 10 refs. [See A67-13142 03-16]

DETERMINATION OF VOLUME AND SURFACE INHOMOGENEITIES OF THE ACTIVE MEDIA AND INTERFEROMETRIC MIRRORS OF LASERS [OPREDELENIE OB'EMNYKH I POVERKHNOSTNYKH NEODNORODNOSTEI AKTIVNYKH TEL I INTERFEROMETRICHESKIKH ZERKAL OPTICHESKIKH KVANTOVYKH GENERATOROV]. M. P. Lisitsa, L. I. Berezhinskii, and M. Ia. Valakh, p. 327-346. 9 refs. [See A67-13143 03-16]

**A67-13127 #**

THE KINETIC-EQUATION METHOD IN THE THEORY OF GENERATION OF OPTICAL HARMONICS [METOD KINETICHESKIKH URAVNENII V TEORII GENERATSII OPTICHESKIKH GARMONIK].

I. A. Marushko and V. S. Mashkevich (Akademiia Nauk Ukrainskoi SSR, Institut Fiziki, Kiev, Ukrainian SSR).  
IN: QUANTUM ELECTRONICS [KVANTOVAIA ELEKTRONIKA].  
Edited by M. P. Lisitsa.

Kiev, Izdatel'stvo Naukova Dumka, 1966, p. 34-76. 20 refs. In Russian.

Application of the kinetic-equation method to various problems involving the generation of harmonics by quantum techniques. The kinetic equations for the generation of the second optical harmonic are derived from the equation for the density matrix. Second-harmonic generation in a plane-parallel plate is discussed. A study is made of the line shapes in second-harmonic generation with a given fundamental-frequency pumping. The problem of second-harmonic generation in a laser cavity under various pumping conditions is considered. Possible methods of third-harmonic generation are suggested.

A.B.K.

#### A67-13128 #

CERTAIN EFFECTS OF THE INTERACTION BETWEEN A RUBY LASER BEAM AND "TRANSPARENT" CRYSTALS [NEKOTORYE EFFEKTY VZAIMODEISTVIA PUCHKA RUBINOVOGO LAZERA S "PROZRACHNYMI" KRISTALLAMI].

M. S. Brodin, V. N. Vatulov, S. V. Zakrevskii, and A. M. Kamuz (Akademiia Nauk Ukrainskoi SSR, Institut Fiziki, Kiev, Ukrainian SSR).

IN: QUANTUM ELECTRONICS [KVANTOVAIA ELEKTRONIKA].

Edited by M. P. Lisitsa.

Kiev, Izdatel'stvo Naukova Dumka, 1966, p. 77-90. 24 refs. In Russian.

Study of the mechanism of fracture of "transparent" crystals by a concentrated ruby-laser beam. The nature of the damage occurring in the crystal in this case is found to resemble the situation occurring when the crystal is acted upon by large localized mechanical forces. It is believed that these forces may arise as a result of large local heat liberations accompanied by sudden heat expansion or even by vaporization of small quantities of material. Since the number of fractures is higher in the case of a crystal with a large amount of impurities, it is concluded that the heating centers are probably defect sites.

A.B.K.

#### A67-13129 #

STUDY OF CERTAIN LASER PARAMETERS [ISSLEDOVANIE NEKOTORYKH PARAMETROV OPTICHESKIKH KVANTOVYKH GENERATOROV].

M. P. Lisitsa, A. M. Iaremko, and N. R. Kulish (Akademiia Nauk Ukrainskoi SSR, Institut Poluprovodnikov, Kiev, Ukrainian SSR).

IN: QUANTUM ELECTRONICS [KVANTOVAIA ELEKTRONIKA].

Edited by M. P. Lisitsa.

Kiev, Izdatel'stvo Naukova Dumka, 1966, p. 91-106. 8 refs. In Russian.

Study of the possible oscillation modes occurring in a cylindrical solid-state laser. The dependence of the pumping threshold, the output power, and the angle of divergence on the length of the resonator is ascertained theoretically (in an approximation of geometrical optics) and experimentally.

A.B.K.

#### A67-13130 #

LINEAR PHASE DISTORTIONS OF A RESONATOR AND GENERATION OF INDUCED EMISSION IN A RUBY CRYSTAL [LINEINYE FAZOVYE ISKAZHENIYA REZONATORA I GENERATSIIA INDITSIROVANNOGO IZLUCHENIIA NA KRISTALLE RUBINA].

M. S. Soskin (Akademiia Nauk Ukrainskoi SSR, Institut Fiziki, Kiev, Ukrainian SSR).

IN: QUANTUM ELECTRONICS [KVANTOVAIA ELEKTRONIKA].

Edited by M. P. Lisitsa.

Kiev, Izdatel'stvo Naukova Dumka, 1966, p. 107-122. 29 refs. In Russian.

Study of the generation of induced emission in a ruby crystal in a plane resonator with tilted mirrors. The effect of the inclination of the mirrors on "free" generation in a ruby laser is ascertained, as well as the effect of the orientation of the crystal in the resonator on the operation of the laser. Laser generation in a ruby crystal in a resonator with low Fresnel numbers is discussed.

A.B.K.

#### A67-13131 #

A LASER WITH A TUNABLE FREQUENCY [OPTICHESKII KVANTOVYI GENERATOR S PERESTRAIVAE MOI CHASTOTOI].

V. L. Broude and M. S. Soskin (Akademiia Nauk Ukrainskoi SSR, Institut Fiziki, Kiev, Ukrainian SSR).

IN: QUANTUM ELECTRONICS [KVANTOVAIA ELEKTRONIKA].

Edited by M. P. Lisitsa.

Kiev, Izdatel'stvo Naukova Dumka, 1966, p. 123-136. 26 refs. In Russian.

Study of the problem of broadening the spectral range of laser emission and increasing the number of operating points within the range. The possibility of obtaining operating frequencies other than the fundamental frequency by varying the spectral properties of the laser resonator and by making use of a multiphoton interaction between a high-power induced-emission beam and nonlinear media is demonstrated. The use of a tunable dispersion resonator, a dispersion resonator with a multifrequency active medium, or a decoupled dispersion resonator with secondary systems is suggested as a means to this end.

A.B.K.

#### A67-13132 #

UNCOUPLED INTENSITY PEAKS IN LASER EMISSION [NESVIAZANNYE PIKI INTENSIVNOSTI V IZLUCHENII LAZERA].

A. M. Ratner, I. A. Rom-Krichevskia, and Iu. A. Tiunov (Akademiia Nauk Ukrainskoi SSR, Fiziko-Tekhnicheskii Institut Nizkikh Temperatur, Kharkov, Ukrainian SSR).

IN: QUANTUM ELECTRONICS [KVANTOVAIA ELEKTRONIKA].

Edited by M. P. Lisitsa.

Kiev, Izdatel'stvo Naukova Dumka, 1966, p. 137-143. In Russian.

Study of uncoupled intensity peaks occurring in laser emission when the optical axes of the plane reflectors are disoriented and form a certain angle  $\beta$ . It is shown that when this angle is sufficiently large the light energy generated in a given peak does not reach the subsequent peak, as a result of which each intensity peak is formed independently of the preceding peaks. The distinctions between these uncoupled peaks and ordinary oscillations are considered.

A.B.K.

#### A67-13133 #

STUDY OF LASER LOSSES AND ASSOCIATED EMISSION CHARACTERISTICS [ISSLEDOVANIE POTER' I SVIAZANNYKH S NIMI KHARAKTERISTIK IZLUCHENIIA LAZERA].

N. L. Kramarenko, A. V. Meshcheriakov, Iu. V. Nabokin, A. M. Ratner, and I. A. Rom-Krichevskia (Akademiia Nauk Ukrainskoi SSR, Fiziko-Tekhnicheskii Institut Nizkikh Temperatur, Kharkov, Ukrainian SSR).

IN: QUANTUM ELECTRONICS [KVANTOVAIA ELEKTRONIKA].

Edited by M. P. Lisitsa.

Kiev, Izdatel'stvo Naukova Dumka, 1966, p. 144-149. 6 refs. In Russian.

Description of an experimental method of determining the emission losses in a laser resonator. The losses of a neodymium glass sample are determined within the framework of a four-level scheme, the dependence of the output energy on the losses is ascertained, and the results of the calculation are compared with experimental data.

A.B.K.

#### A67-13134 #

RADIATION CHARACTERISTICS OF A LASER IN THE STATIONARY STATE AND DURING RELAXATION [KHARAKTERISTIKI IZLUCHENIIA LAZERA V STATSIONARNOM REZHIME I V PROTSESSE RELAKSATSII].

A. M. Ratner (Akademiia Nauk Ukrainskoi SSR, Fiziko-Tekhnicheskii Institut Nizkikh Temperatur, Kharkov, Ukrainian SSR).

IN: QUANTUM ELECTRONICS [KVANTOVAIA ELEKTRONIKA].

Edited by M. P. Lisitsa.

Kiev, Izdatel'stvo Naukova Dumka, 1966, p. 150-165. 11 refs. In Russian.

Theoretical study of time-dependent spectral composition, oscillation types, and polarization behavior of a laser in the process of their monotonic variations prior to the onset of the stationary state. It is assumed that the resonator produces a number of modes great enough to allow a continuous spectrum of radiation. It is shown that the establishment of a stationary radiation state is generally a much slower process than the leveling of intensity fluctuations.

V. Z.

**A67-13135 #**

LASER Q-FACTOR MODULATION WITH THE AID OF NONLINEAR EFFECTS IN ABSORBING MEDIA [MODULIATSIA DOBROTNOSTI LAZERA S POMOSHCH'U NELINEIYNYKH EFFEKTOV V POGLO-SHCHAIUSHCHIKH SREDAKH].

A. M. Ratner (Akademiia Nauk Ukrainskoi SSR, Fiziko-Tekhnicheskii Institut Nizkikh Temperatur, Kharkov, Ukrainian SSR).  
IN: QUANTUM ELECTRONICS [KVANTOVAIA ELEKTRONIKA].

Edited by M. P. Lisitsa.

Kiev, Izdatel'stvo Naukova Dumka, 1966, p. 166-182. 10 refs. In Russian.

Theoretical study of processes that occur in a laser containing an absorbing medium, examining results in pulsed Q-factor modulation. The absorbing medium in the resonator functions as an optical shutter which opens when the absorption centers are excited by laser radiation. An expression describing the functioning of an optical shutter is derived. Among the subjects considered are energy storage processes during the early stage of generation, the case of a frequently opening optical shutter, and a laser with three-level pumping.

V. Z.

**A67-13137 #**

THEORY OF LASER RADIATION INDUCED BY IMPURITY-BAND TRANSITIONS [TEORIYA LAZERNOGO IZLUCHENIIA NA PRIMES-NOZONNYKH PEREKHODAKH].

V. L. Vinetskii, N. N. Kolychev, and V. S. Mashkevich (Akademiia Nauk Ukrainskoi SSR, Institut Fiziki and Institut Poluprovodnikov, Kiev, Ukrainian SSR).

IN: QUANTUM ELECTRONICS [KVANTOVAIA ELEKTRONIKA].

Edited by M. P. Lisitsa.

Kiev, Izdatel'stvo Naukova Dumka, 1966, p. 214-227. 7 refs. In Russian.

Discussion of the laser-type regime of a semiconductor in which radiation is produced in direct impurity-band transitions of current carriers. The Boltzmann hole-band acceptor distribution, intensive hole-band acceptor degeneration, energy absorption by free carriers, and donor behavior are considered.

V. Z.

**A67-13138 #**

REVIEW OF EXTERNAL SUPERHIGH-FREQUENCY MODULATION TECHNIQUES FOR LASERS [OBZOR METODOV VNESHNEI SVERKH-VYSOKOCHASTOTNOI MODULIATSII OPTICHESKIKH KVANTOVYKH GENERATOROV].

I. A. Deriugin, I. P. Pugach, and A. A. Solomko (Kievskii Gosudarstvennyi Universitet, Kiev, Ukrainian SSR).

IN: QUANTUM ELECTRONICS [KVANTOVAIA ELEKTRONIKA].

Edited by M. P. Lisitsa.

Kiev, Izdatel'stvo Naukova Dumka, 1966, p. 228-258. 48 refs. In Russian.

Review of current methods for shf modulation of laser radiation. Methods covered are (1) light oscillation phase control by magnetic fields (Faraday effect), (2) absorption capacity control in magnetic substances by a magnetic field (circular dichroism), (3) light oscillation phase control in paraelectric media by an electrical field (Kerr and Pockels effects), and (4) modulating effect of electrical fields applied to the edge of a semiconductor light absorption band.

V. Z.

**A67-13142 #**

USE OF LASERS FOR STUDYING THE KINETICS OF AUTOPHOTO-ELECTRONIC EMISSION [PRIMENENIE OKG DLIA ISSLEDOVANIA KINETIKI AVTOFOTOELEKTRONNOI EMISSII].

A. F. Iatsenko, Iu. A. Kuliupin, and B. V. Stetsenko (Akademiia Nauk Ukrainskoi SSR, Institut Fiziki, Kiev, Ukrainian SSR).

IN: QUANTUM ELECTRONICS [KVANTOVAIA ELEKTRONIKA].

Edited by M. P. Lisitsa.

Kiev, Izdatel'stvo Naukova Dumka, 1966, p. 322-326. 10 refs. In Russian.

Description of the use of a continuous helium-neon laser in obtaining short intense light pulses and in studying the kinetics of autophotoelectronic emission of high-resistivity silicon. Studies are carried out by two methods - by measuring the drop in the autophotoelectronic emission during pulse illumination and by determining the variable and constant components of the autophotoelectronic emission of the current during illumination by a sinusoidally modulated light.

A. B. K.

**A67-13143 #**

DETERMINATION OF VOLUME AND SURFACE INHOMOGENEITIES OF THE ACTIVE MEDIA AND INTERFEROMETRIC MIRRORS OF LASERS [OPREDELENIE OB'EMNYKH I POVERKHNOSTNYKH NEOD-NORODNOSTEI AKTIVNYKH TEL I INTERFEROMETRICHESKIKH ZERKAL OPTICHESKIKH KVANTOVYKH GENERATOROV].

M. P. Lisitsa, L. I. Berezinskii, and M. Ia. Valakh.

IN: QUANTUM ELECTRONICS [KVANTOVAIA ELEKTRONIKA].

Edited by M. P. Lisitsa.

Kiev, Izdatel'stvo Naukova Dumka, 1966, p. 327-346. 9 refs. In Russian.

Description of the methods and equipment used in checking the surface finish and determining the inhomogeneities of the active media and interferometric mirrors of lasers. An analysis is made of the possibilities of using standard prism and diffraction instruments in checking surface finishes. Methods of obtaining and processing interferograms for this purpose are outlined. An assessment is made of various optical methods of carrying out quantitative determinations of volume inhomogeneities. The use of two types of interferometers in these determinations is described, and their advantages and disadvantages are cited.

A. B. K.

**A67-13153 #**

GENERATION ON  $\text{CdS}_x\text{-CdSe}_{1-x}$  MIXED CRYSTALS IN THE PRESENCE OF EXCITATION BY RUBY LASER EMISSION [GENERATSIIA NA SMESHANNYKH KRISTALLAKH  $\text{CdS}_x\text{-CdSe}_{1-x}$  PRI VOZBUZHDENII IZLUCHENIEM RUBINOVOGO OKG].

M. S. Brodin, N. I. Vitrikhovskii, S. V. Zakrevskii, and V. Ia. Reznichenko (Akademiia Nauk Ukrainskoi SSR, Institut Fiziki and Institut Poluprovodnikov, Kiev, Ukrainian SSR).

*Fizika Tverdogo Tela*, vol. 8, Oct. 1966, p. 3084-3086. 9 refs.

In Russian.

Study of the possibility of obtaining luminescence in  $\text{CdS}_x\text{-CdSe}_{1-x}$  mixed crystals of widely varying composition in the presence of excitation by ruby laser emission. It is shown that such generation is not only possible, but that, by varying the composition of the crystals, the entire spectral range of generation from 4960 Å (CdS) to at least 6240 Å, and apparently up to 6800 Å (CdSe), can be covered in gradual stages. The experimentally established properties of the induced emission are said to be of exciton nature. The experimentally observed displacement of the generation line from the spontaneous-luminescence edge band is attributed to the participation of optical phonons in the generation process.

A. B. K.

**A67-13201 #**

STUDY OF THE EMISSION OF A NEODYMIUM LASER TRIGGERED BY THE POCKELS EFFECT [ETUDE DE L'EMISSION D'UN LASER AU NEODYME, DECLENCHE PAR EFFET POCKELS].

P. Wurtz (Laboratoire d'Electronique et de Physique Appliquée, Limeil-Brevannes, Seine-et-Oise, France).

*Philips Research Reports*, vol. 21, Aug. 1966, p. 213-245. 5 refs.

In French.

A short description of the Q-switched laser under investigation is given; the general principles of laser effect are then recalled, and the fluorescence of doping elements is studied. The fluorescence intensity being inversely proportional to the population, the knowledge of fluorescence gives information about the population density in the metastable level at any moment after pumping is started. The studies were made on the basis of calculations which were verified by experiments. The variations of the amplitude, form, and time delay of the laser pulse after switching the Q-spoiling element as functions of the inversion of the population are studied. A good agreement between theoretical and experimental results is found.

(Author)

**A67-13207**

INFLUENCE OF DIFFUSION OF EXCITATION ON THE CONDITIONS OF MULTIMODE GENERATION.

B. L. Livshits, S. N. Stoliarov, and V. N. Tsikunov (Akademiia Nauk SSSR, Institut Obshchei i Neorganicheskoi Khimii, Moscow, USSR).

*(Akademiia Nauk SSSR, Doklady, vol. 168, May 1, 1966, p. 72-75.)*

*Soviet Physics - Doklady*, vol. 11, Nov. 1966, p. 412-415. 5 refs. Translation.

## A67-13208

Discussion of axial modes in the spectral composition of the radiation emitted by lasers which appear when the pumping energy exceeds the threshold energy. The equations for the density of photons and the inversion of population are examined taking into account diffusion. Only axial modes are studied under the assumption that under the experimental conditions the number of axial modes generated simultaneously is  $(2j + 1)$ .

M. F.

## A67-13208

### THEORY OF UNDAMPED INTENSITY PULSATIONS IN LASERS.

N. G. Basov, V. N. Morozov, and A. N. Oraevskii (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR). (Akademiia Nauk SSSR, Doklady, vol. 168, May 21, 1966, p. 550-553.) Soviet Physics - Doklady, vol. 11, Nov. 1966, p. 438-440. Translation.

[For abstract see issue 18, page 3118, Accession no. A66-33839]

## A67-13209

### MEASUREMENT OF ELECTRON TEMPERATURE AND CONCENTRATION IN AN ARC PLASMA VIA THOMSON SCATTERING OF LASER LIGHT.

G. M. Malyshev, G. V. Ostrovskaia, G. T. Razdobarin, and L. V. Sokolova (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR).

(Akademiia Nauk SSSR, Doklady, vol. 168, May 21, 1966, p. 554, 555.)

Soviet Physics - Doklady, vol. 11, Nov. 1966, p. 441, 442. 9 refs. Translation.

[For abstract see issue 18, page 3118, Accession no. A66-33840]

## A67-13283 #

### QUANTUM SIGNALS AND THEIR POTENTIAL APPLICABILITY TO RADAR.

P. A. Bakut.

(Radiotekhnika i Elektronika, vol. 11, Apr. 1966, p. 643-652.)

Radio Engineering and Electronic Physics, vol. 11, Apr. 1966, p. 551-559. 8 refs. Translation.

[For abstract see issue 14, page 2242, Accession no. A66-28157]

## A67-13286 #

### MODE SELECTION IN THE SEMICONCENTRIC CAVITY OF A GASEOUS LASER OSCILLATOR.

A. V. Korovitsyn, L. V. Naumova, and Z. T. Lebedinskaia.

(Radiotekhnika i Elektronika, vol. 11, Apr. 1966, p. 668-674.)

Radio Engineering and Electronic Physics, vol. 11, Apr. 1966, p. 572-577. Translation.

[For abstract see issue 14, page 2310, Accession no. A66-28160]

## A67-13292 #

### THE THEORY OF TWO-PHOTON LASER.

A. V. Uspenskii,

(Radiotekhnika i Elektronika, vol. 11, Apr. 1966, p. 766, 767.)

Radio Engineering and Electronic Physics, vol. 11, Apr. 1966, p. 661, 662. Translation.

[For abstract see issue 14, page 2310, Accession no. A66-28166]

## A67-13297 #

### MECHANISM CAUSING THE INVERSE POPULATION OF THE CO<sub>2</sub> LASER LEVELS [O MEKHAUZME, OBESPECHIVAUSHCHEM INVERSNUIU ZASELENNOSTI UROVNEI V OKG, RABOTAUSHCHIKH NA CO<sub>2</sub>].

N. N. Sobolev and V. V. Sokovikov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

ZHETF Pis'ma v Redaktsiiu, vol. 4, Oct. 15, 1966, p. 303-307. 11 refs. In Russian.

Review of the question concerning the basic factors causing the inverse population of the 00<sup>0</sup>1 upper laser level of CO<sub>2</sub> molecules in lasers using a CO<sub>2</sub>-N<sub>2</sub> mixture. The dependence of the effective

cross-section of inelastic electron collisions with N<sub>2</sub> molecules and CO molecules on electron energy is examined. The addition of Ne to CO<sub>2</sub> and to the CO<sub>2</sub>-N<sub>2</sub> mixture leads not only to an increase in the population of the upper laser level but also to a decrease in the lower level.

S. Z.

## A67-13474

### DIAGNOSTIC METHODS OF PLASMAS USING LASERS [LES METHODES DE DIAGNOSTIC DES PLASMAS UTILISANT DES LASERS].

François Rostas (Compagnie Générale d'Electricité de Paris, Centre de Recherches, Marcoussis, Seine-et-Oise, France). Journal de Physique, vol. 27, May-June 1966, p. 367-384. 50 refs. In French.

Use of lasers to extend to optical frequencies certain plasma diagnostic method which were first introduced at radio frequencies. Two sets of methods are considered: interferometric methods (which are based on the measurement of the index of refraction of the plasma, with or without a magnetic field) and methods employing the diffusion of light by free electrons (Thomson diffusion). Basic principles of each set of methods are given, and various published experiments are reviewed.

M. F.

## A67-13480

### THRESHOLD DEPENDENCY ON PHOTON ENERGY IN GaAs LASER DIODES.

M. F. Lamorte, T. Gonda, and H. Junker (Radio Corporation of America, RCA Electronic Components and Devices Div., Somerville, N.J.).

Solid-State Electronics, vol. 9, Nov.-Dec. 1966, p. 1075-1079. 7 refs.

Contract No. DA-44-009-AMC-1287(T).

Study of the relationship between the threshold current density and photon energy for GaAs laser diodes at a given temperature. In all measurements taken, the laser photon energy was obtained at the leading edge of the pulse of a time-resolved spectrum in order to eliminate heating effects. It is shown that the threshold increases with increasing laser photon energy at 77°K; similar data are given for a temperature of 300°K. A model is given to explain these data based on the Heisenberg uncertainty principle, in which the laser photon oscillation spreads out into the noninverted p- and n-type regions surrounding the inverted population region of the p-n junction.

B. B.

## A67-13500 #

### EXPERIMENTAL OBSERVATIONS OF THE TRANSITION TO DETONATION IN AN EXPLOSIVE GAS.

P. A. Urtiew and A. K. Oppenheim (California, University, Berkeley, Calif.).

Royal Society (London), Proceedings, Series A, vol. 295, Nov. 8, 1966, p. 13-28. 29 refs.

Grant No. AF AFOSR 129-65.

Discussion of the results obtained with the use of two novel experimental techniques in the study of the transition to detonation in a gaseous medium. One exploits the fact that a self-sustained detonation front, unlike any other wave associated with the transition process, is capable of leaving imprints on the wall along which it travels. The other is based on the adaptation of an amplitude-modulated, giant-pulse laser system as a light source for stroboscopic schlieren photography. The results demonstrate that the transition can take place in various modes depending on the wave interaction processes which occur ahead of the accelerating flame.

S. Z.

## A67-13536 #

### CALORIMETER FOR LASER ENERGY AND OUTPUT POWER [KALORYMETRYCZNY MIERNIK ENERGII I MOCY WYJŚCOWEJ LASERÓW].

Wiesław Woliński and Wojciech Badziak (Warszawa, Politechnika, Katedra Prządów Elektronowych, Warsaw, Poland).

Pomiary, Automatyka, Kontrola, vol. 12, Oct. 1966 (Optyka, vol. 2, Oct. 1966, p. 44-47). 7 refs. In Polish.

Discussion of the principles of operation of a device which uses an absorbing element characterized by varying resistance to measure the energy and output power of pulsed CW lasers. A design is described in which the absorbing element is in the form of a brush consisting of enameled copper wire. Results obtained with such a device indicate that an element of this type provides nearly 100% absorption of radiation. V. P.

**A67-13572****PARAMETRIC AMPLIFICATION IN THE FAR INFRARED.**

C. K. N. Patel (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

Applied Physics Letters, vol. 9, Nov. 1, 1966, p. 332-334. 10 refs.

We report the observation of parametric amplification of far infrared radiation in a crystal of tellurium which was pumped at  $10.6 \mu$  by a  $\text{CO}_2$  laser. A gain of 3 db was measured at  $17.888\text{-}\mu$  wavelength which was obtained from a far infrared neon laser. Comparison between calculated and measured values of gain show reasonable agreement. (Author)

**A67-13573****EXPANSION RATES OF THE LUMINOUS FRONT OF A LASER-PRODUCED PLASMA.**

Hugo Weichel and P. V. Avizonis (USAF, Systems Command, Research and Technology Div., Weapons Laboratory, Kirtland AFB, N. Mex.).

Applied Physics Letters, vol. 9, Nov. 1, 1966, p. 334-337. 10 refs. ARPA-supported research.

The expansion velocity of the luminous front of a plasma plume created by a giant pulse laser has been measured both as a function of time during the laser pulse and as a function of position in front of the pyrolytic graphite target. The initial velocity of the vapor appears to agree with the sublimation temperature of pyrolytic graphite. The subsequent vapor absorption of laser radiation produced peak final expansion velocities of  $7 \times 10^6$  cm/sec. The luminous front was found to accelerate from  $4.8 \times 10^5$  to  $7.0 \times 10^6$  cm/sec within a 0.3-cm distance for a laser energy density of 700 joules/cm<sup>2</sup>. (Author)

**A67-13678****COUPLING OF HIGH PEAK POWER PULSES FROM He-Ne LASERS.**

William H. Steier (Bell Telephone Laboratories, Inc., Crawford Hill Laboratory, Holmdel, N.J.).

IEEE, Proceedings, vol. 54, Nov. 1966, p. 1604-1606.

Description of the coupling of pulse powers in the TEM<sub>00q</sub> mode of up to 80 mw from a He-Ne laser at  $6328 \text{ \AA}$ . The light pulses were produced by applying voltage pulses to a KDP coupling modulator inside the laser cavity. The high peak powers were possible because all of the stored light energy was extracted from the laser cavity in a pulse 80 nsec wide at its base. Measurements were made to determine whether the peak powers observed were consistent with the cavity-stored energy. The average of several measurements gave a predicted peak power 1.11 times the observed peak power. Since the observed pulses had some rounding at their peaks, the agreement was considered to be very good. M. M.

**A67-13801****LASER DISPLAYS.**

H. R. Senf (Hughes Aircraft Co., Research Laboratories, Malibu, Calif.).

Society of Motion Picture and Television Engineers, Semiannual Technical Conference and Equipment Exhibit, 100th, Los Angeles, Calif., Oct. 2-7, 1966, Preprint 100-2. 12 p. 6 refs. \$0.75.

Contract No. AF 30(602)-4097.

The status of existing devices and techniques for generating, modulating, and deflecting high-power visible laser beams for application to visual displays is described. Some current research on the application of electro-optics to achieve high-speed random-access deflection of laser beams is outlined. The advantages and disadvantages of two approaches to aperiodic deflection are discussed. Some of the motivating forces for development of laser displays are described. (Author)

**A67-13839 #****RECRYSTALLIZATION OF THIN SEMICONDUCTOR FILMS UNDER THE ACTION OF LASER RADIATION [REKRISTALLIZATSIIA TONKIKH POLUPROVODNIKOVYKH PLENOK POD VOZDEISTVIE IZLUCHENIYA LAZERA].**

V. P. Zakharov, Iu. A. Tsvirko, and V. N. Chugaev.

Akademiia Nauk SSSR, Doklady, vol. 170, Oct. 11, 1966, p. 1056-1058. In Russian.

Study of the recrystallization process produced by a laser beam delivering 1 joule in  $10^{-3}$  sec in amorphous  $1000\text{-}\text{\AA}$  Ge films prepared by thermal deposition on glass and transferred to Al foil. The mechanism of heat transfer in a film during the process is analyzed. A method is proposed for the recrystallization of thin Ge films using a laser beam as the thermal source. V. Z.

**A67-13912****COMPARISON OF THE He-Ne LASER WITH THE Hg 4358 AND 5461 Å LINES AS A RAMAN EXCITATION SOURCE.**

M. V. Evans, T. M. Hard, and W. F. Murphy (Wisconsin, University, Dept. of Chemistry, Madison, Wis.).

Optical Society of America, Journal, vol. 56, Nov. 1966, p. 1638, 1639.

Direct comparison of a CW helium-neon laser with a conventional mercury arc source, using a large-aperture photographic-photoelectric Raman spectrometer to obtain Raman spectra of liquid  $\text{CCl}_4$  by three methods of excitation. It is concluded that in the range 0 to  $1000 \text{ cm}^{-1}$  the methods are roughly comparable in photoelectric efficiency. Beyond  $1000 \text{ cm}^{-1}$ , the decreasing sensitivity of the photocathode should make the comparison less favorable to the laser. F. R. L.

**A67-13962 #****TOWARD DESIGN OF A LASER WITH PASSIVE SHUTTER.**

A. L. Mikaelian, V. G. Savel'ev, and Iu. G. Turkov.

(Radiotekhnika i Elektronika), vol. 11, May 1966, p. 946, 947.)

Radio Engineering and Electronic Physics, vol. 11, May 1966, p. 822, 823. Translation.

Description of results of computer calculations permitting the investigation of the time characteristics of the radiation in an investigation of a laser with a passive cell. The shape of the radiation pulse of the laser with passive shutter for the lifetime  $t' = 10^{-9}$  is shown. The calculations show that for real values of lifetime  $t'$ , the relaxation of cell particles has practically no effect on the radiated power. This is associated with the fact that, in order to maintain the cell in the illuminated state, only a small portion of the radiated energy is expended. M. M.

**A67-13982****PHOTON CORRELATIONS IN IONISING LASER BEAMS.**

J. W. Gardner (English Electric Co., Ltd., Whetstone, Leics., England).

Electronics Letters, vol. 2, Nov. 1966, p. 397, 398. 13 refs.

Investigation of a special case of the Poisson distribution (Furry distribution) which describes photon correlations in ionizing laser beams. Given independent evidence that the Furry distribution applies, the results enable the differentiation between various multiphoton ionization processes. B. B.

**A67-13986****FERRIC-DOPED-RUTILE 8 MM MASER.**

W. M. Nixon and R. Genner (Ministry of Aviation, Royal Radar Establishment, Great Malvern, Worcs., England).

Electronics Letters, vol. 2, Nov. 1966, p. 406, 407.

An experimental iron-doped-rutile traveling-wave maser having an electronic gain of 8 db/cm at signal frequencies in the range 34.5-35.5 GHz has been produced. The device is operated at  $4^\circ\text{K}$ ; a filled-waveguide structure is used with composite taper/quarter-wave matching sections. The insertion loss of this type of structure is approximately 1 db/cm. (Author)

**A67-13988**

STATISTICAL DISTRIBUTION OF THE ENVELOPE OF AN AMPLITUDE-MODULATED LASER SIGNAL AFTER PASSAGE THROUGH A TURBULENT ATMOSPHERE.

M. Chomát and F. Hoff (Československá Akademie Věd, Ústav Radiotechniky a Elektroniky, Prague, Czechoslovakia). Electronics Letters, vol. 2, Nov. 1966, p. 409, 410.

The influence of turbulence on the statistical distribution of the envelope of a modulated laser signal is experimentally investigated. From the experiments, it has been found that the distribution is largely dependent on the distance. (Author)

**A67-13989**

COHERENT HOMODYNE DETECTION AT 10.6  $\mu\text{m}$  WITH AN EXTRINSIC PHOTOCONDUCTOR.

R. A. Soref (Sperry Rand Corp., Sperry Rand Research Center, Sudbury, Mass.).

Electronics Letters, vol. 2, Nov. 1966, p. 410-412. 5 refs.

Use of a laser-driven IR-homodyne arrangement to yield a substantial increase in the sensitivity of a doped-silicon photoconductor. Unfocused radiation from a 10.6- $\mu\text{m}$  flowing-gas  $\text{CO}_2\text{-N}_2\text{-He}$  laser was sent into a Mach-Zehnder interferometer using NaCl beam-splitters. One of the two radiation beams in the interferometer is designated as the local-oscillator beam, and the other is the signal beam. Frequency translation of the signal beam was accomplished by interrupting it with a mechanical chopper. The noise performance of the homodyne system is best at the high-frequency end of the measurement range. The improvement in detectivity was found to be limited by excess local-oscillator noise. F. R. L.

**A67-13992**

RING-LASER ACCURACY.

A. F. H. Thomson and P. G. R. King (Services Electronics Research Laboratory, Baldock, Herts., England).

Electronics Letters, vol. 2, Nov. 1966, p. 417.

The letter describes the construction and performance of a novel ring-laser rotation-sensing system designed to evaluate the limit of accuracy obtainable when known sources of inaccuracy have been minimized. The probable cause of the residual system inaccuracy is discussed, and proposals are made for dealing with it. (Author)

**A67-14047**

HIGH-TEMPERATURE PLASMAS PRODUCED BY LASER BEAM IRRADIATION OF SINGLE SOLID PARTICLES.

Alan F. Haught and Donald H. Polk (United Aircraft Corp., Research Laboratories, East Hartford, Conn.).

Physics of Fluids, vol. 9, Oct. 1966, p. 2047-2056. 20 refs.

AEC-supported research.

The focused 20-Mw giant pulse beam of a Q-spoiled ruby laser has been used to form a high-temperature, high-density plasma from a single 10- to 20- $\mu\text{m}$ -diam solid particle of lithium hydride suspended by a set of ac electric fields in a vacuum environment. Charge collection measurements show that total ionization of the  $10^{15}$  atoms in the lithium hydride particle is achieved in the plasma produced. Time-of-flight studies of the expanding plasma yield plasma energies of more than 100 eV. Measurements have been carried out which show that the mass and energy density of the expanding plasma are isotropically distributed in space. The results obtained are in good agreement with a simple model of the plasma formation and expansion. Further studies of these laser-irradiated, single particle plasmas are in progress and include measurements of the lifetime of the plasma in magnetic confinement fields. (Author)

**A67-14185 #**

MINIMIZING THE DIVERGENCE OF LASER BEAMS.

V. V. Liubimov.

(Optika i Spektroskopiia, vol. 21, Aug. 1966, p. 224-227.)

Optics and Spectroscopy, vol. 21, Aug. 1966, p. 129, 130. 6 refs.

Translation.

[For abstract see issue 23, page 4078, Accession no. A66-41449]

**A67-14186 #**

AMPLIFICATION OF SPONTANEOUS RADIATION IN AN INVERSELY POPULATED MEDIUM.

V. N. Morozov.

(Optika i Spektroskopiia, vol. 21, Aug. 1966, p. 230-232.)

Optics and Spectroscopy, vol. 21, Aug. 1966, p. 133, 134. Translation.

[For abstract see issue 23, page 4078, Accession no. A66-41450]

**A67-14188 #**

SOME RESULTS OF A STUDY OF THE PULSED ARGON LASER.

R. K. Leonov, E. D. Protzenko, and Iu. M. Sapunov.

(Optika i Spektroskopiia, vol. 21, Aug. 1966, p. 243, 244.)

Optics and Spectroscopy, vol. 21, Aug. 1966, p. 141, 142. 5 refs.

Translation.

[For abstract see issue 23, page 4078, Accession no. A66-41452]

**A67-14189 #**

CHARACTERISTICS OF PULSED LASER ACTION IN HELIUM-NEON AND HELIUM-ARGON MIXTURES.

E. I. Shtyrkov and E. V. Subbes.

(Optika i Spektroskopiia, vol. 21, Aug. 1966, p. 245, 246.)

Optics and Spectroscopy, vol. 21, Aug. 1966, p. 143, 144. 8 refs.

Translation.

Description of the characteristics of pulsed laser action in He-Ne and He-Ar mixtures at pressures above 200 mm Hg. The shape of a laser pulse at a wavelength of 1.15  $\mu$  in a mixture of He-Ne is shown as an example. Here both peaks of the laser action are observed at the same time. The time difference between the current pulse and the appearance of the laser pulse apparently depends on the various mechanisms for creating inversion. An estimate of the recombination rate under the experimental conditions indicates that atomic recombination will occur primarily by ternary collisions of an ion with two electrodes and that dissociative recombination will also occur in a way in which the metastable  $2^3\text{S}_1$  atoms of helium play an essential role in the formation of the molecular ions  $(\text{HeNe})^+$  and  $(\text{HeAr})^+$ . M. M.

**A67-14190 #**

THE OUTPUT POWER OF A GAS LASER USING NEARLY CONFOCAL RESONATORS.

N. I. Kaliteevskii, M. M. Popov, Iu. A. Rymarchuk, T. B. Tolchinskaya, and M. P. Chaika.

(Optika i Spektroskopiia, vol. 21, Aug. 1966, p. 258-260.)

Optics and Spectroscopy, vol. 21, Aug. 1966, p. 152-154. 7 refs.

Translation.

[For abstract see issue 23, page 4078, Accession no. A66-41453]

**A67-14194 #**

HEATING AND SCATTERING OF A PLASMA PRODUCED BY A GIANT LASER PULSE FOCUSED ON A SOLID TARGET [NAGREVA-NIE I RAZLET PLAZMY, OBRAZUIUSHCHEISIA PRI VOZDEISTVII SFOKUSIROVANNOGO GIGANTSKOGO IMPUL'SA LAZERA NA TVERDUIU MISHEN'].

N. G. Basov, V. A. Boiko, V. A. Dement'ev, O. N. Krokhin, and G. V. Sklizkov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

Akademiia Nauk SSSR, Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 51, Oct. 1966, p. 989-1000. 17 refs. In Russian.

Study of the formation and properties of a plasma ("flare") produced by a giant laser emission pulse focused on the surface of a solid target. Space-time diagrams of the scattering of the boundary and various inner parts of the flare are obtained. An estimate is made of the distribution of the particle concentration in the flare, and the dependence of the mass and temperature of the plasma on the laser emission power is determined. A. B. K.

**A67-14197 #**

EFFECT OF COLLISIONS ON THE SPECTRAL CHARACTERISTICS OF GAS LASERS [O VLIIVANII STOLKNOVENII NA SPEKTRAL'NYE KHARAKTERISTIKI GAZOVYKH KVANTOVYKH GENERATOROV]. S. G. Rautian (Akademiia Nauk SSSR, Sibirskoe Otdelenie, Institut Fiziki Poluprovodnikov, Novosibirsk, USSR).

*Akademiia Nauk SSSR, Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, vol. 51, Oct. 1966, p. 1176-1188. 17 refs. In Russian.

Study of the combined effect of Doppler and impact line broadening of the spectral lines of gas lasers, taking into account the statistical relation between these two types of line broadening. The collision integral which describes the diffusion of atoms in the velocity space and takes into account the statistical dependence of the perturbations of the internal motions of an atom on its translational motion is discussed. The effect of saturation in the field of a standing, monochromatic wave is considered for two model expressions for the collision integral, and a calculation is made of the power of a gas laser.

A. B. K.

**A67-14280 #**

VARIATIONS IN THE DISTRIBUTION OF LASER RADIATION FLUX [IZMENENIYA RASPREDELENIYA POTOKA IZLUCHENIYA KVANTOVOGO GENERATORA].

Iu. K. Krylov (Leningradskii Elektrotekhnicheskii Institut, Leningrad, USSR).

*Priroda*, vol. 9, no. 5, 1966, p. 8-13. 5 refs. In Russian.

Development of a method for studying the cross-sectional distribution of a laser beam. An experimental arrangement which makes it possible to investigate the stimulated radiation of a neodymium-glass laser ( $\lambda = 1.063 \mu$ ) is described. It is shown that at different moments of time, radiation is generated in different areas of the sample. The number of these areas changes as the stimulated radiation pulse develops.

V. P.

**A67-14367**

BREAKDOWN IN TRANSPARENT DIELECTRICS CAUSED BY INTENSE LASER RADIATION.

B. M. Ashkinadze, V. I. Vladimirov, V. A. Likhachev, S. M. Ryvkin, V. M. Salmanov, and I. D. Iaroshetskii (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR).

*(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki)*, vol. 50, May 1966, p. 1187-1201.

*Soviet Physics - JETP*, vol. 23, Nov. 1966, p. 788-797. 8 refs. Translation.

[For abstract see issue 18, page 3119, Accession no. A66-34681]

**A67-14371**

MODE INTERACTION IN A GAS LASER.

B. L. Zhelnov, A. P. Kazantsev, and V. S. Smirnov (Akademiia Nauk SSSR, Sibirskoe Otdelenie, Institut Fiziki Poluprovodnikov, Novosibirsk, USSR).

*(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki)*, vol. 50, May 1966, p. 1291-1295.

*Soviet Physics - JETP*, vol. 23, Nov. 1966, p. 858-860. 8 refs. Translation.

[For abstract see issue 18, page 3119, Accession no. A66-34685]

**A67-14376**

THE ROLE OF LIGHT ABSORPTION BY FREE CARRIERS IN A SEMICONDUCTOR LASER.

V. S. Mashkevich and V. L. Vinetskii (Akademiia Nauk Ukrainskoi SSR, Institut Fiziki, Kiev, Ukrainian SSR).

*(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki)*, vol. 50, May 1966, p. 1410-1414.

*Soviet Physics - JETP*, vol. 23, Nov. 1966, p. 935-938. 9 refs. Translation.

[For abstract see issue 18, page 3119, Accession no. A66-34691]

**A67-14394**

FURTHER REMARKS ON ELECTRON BEAM PUMPING OF LASER MATERIALS.

Claude A. Klein (Raytheon Co., Research Div., Waltham, Mass.). *Applied Optics*, vol. 5, Dec. 1966, p. 1922-1924. 9 refs.

Description of the mechanisms involved in generating laser action by means of electron beam bombardment of solids. It is emphasized that because a substantial fraction of the incident electrons can be scattered off the target face, the energy available for laser excitation is  $E_0$  (initial beam energy) minus the amount  $\Delta E$  lost by backscattering. A phenomenological model is developed which is capable of describing all pertinent aspects of electron beam penetration; it shows good agreement with experimental evidence.

B. B.

**A67-14399**

CO<sub>2</sub> LASER SELF-MODULATION CHARACTERISTICS.

G. B. Jacobs (General Electric Co., Defense Electronics Div., Electronics Laboratory, Syracuse, N.Y.).

*Applied Optics*, vol. 5, Dec. 1966, p. 1960, 1961.

Demonstration of the wide range of frequencies and high percentages of self-modulation obtainable from the CO<sub>2</sub> laser, which is useful for measuring such phenomena as the response of detectors or the propagation characteristics of the atmosphere. The laser used gold-coated internal mirrors spaced 215 cm apart, and a 5-cm-diam gas chamber. Gas pressures were helium - 3 torr, nitrogen - 2 torr, and CO<sub>2</sub> - about 1.5 torr and 0.5 torr.

B. B.

**A67-14416**

INTERFERENCES BETWEEN A COHERENT WAVE  $\Sigma'$  EMITTED BY A LASER AND A WAVE  $\Sigma''$  DIFFRACTED BY A SMALL OBJECT IN THE CASE OF A STRONGLY ASTIGMATIC BEAM [INTERFERENCES ENTRE UNE ONDE COHERENTE  $\Sigma'$  EMISE PAR UN LASER ET UNE ONDE  $\Sigma''$  DIFFRACTEE PAR UN OBJET DE FAIBLES DIMENSIONS, DANS LE CAS D'UN FAISCEAU FORTEMENT ASTIGMATIQUE].

Jean Roig, Robert Taravellier, and Guy Mas (Montpellier, Université, Laboratoire d'Optique-Physique, Montpellier, France).

*Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques*, vol. 263, no. 18, Nov. 2, 1966, p. 1014-1017. 7 refs. In French.

Observation of interferences between a coherent light background and light diffracted by a small aperture when the beam is strongly astigmatic. In the experiment, a beam is made to emerge from a gas-laser point source; then it traverses a cylindrical lens and is observed from a great distance on a screen. The diffracting system used is a pinhole pierced in a colored gelatin screen traversed by the primary wave  $\Sigma'$ . Elliptical, rectilinear, or hyperbolic fringes are observed, depending on the position of the pinhole.

A. B. K.

**A67-14505**

MISSILE-ATTITUDE SENSING WITH POLARIZED LASER BEAMS.

John L. Dailey (Radio Corporation of America, Defense Electronic Products, Missile and Surface Radar Div., Advanced Techniques Development Group, Moorestown, N.J.).

IN: RADAR, RANGE INSTRUMENTATION AND MEASUREMENT SYSTEMS.

Camden, N.J., Radio Corporation of America, 1966, p. 32-37.

An optical system has been designed to monitor the attitude of a missile during the early-launch phase. Passive reflective components, mounted on the missile, return a pair of laser beams transmitted from a ground station. The polarization state of the beams is modulated by the reflective elements so that polarization is a function of missile attitude. The returned beams are passed through a polarization-analyzing system at the ground station, and missile attitude is computed from the measured polarization parameters.

(Author)

**A67-14606**

LASER IMPROVES SENSITIVITY OF SCHLIEREN SYSTEMS.

D. H. Murray and Henri Paques (USAF, Office of Aerospace Research, Aerospace Research Laboratories, Fluid Dynamics Facilities Laboratory, Wright-Patterson AFB, Ohio).

*Space/Aeronautics*, vol. 46, Oct. 1966, p. 92, 94, 96-98, 100.



Brief discussion of the significance of sensitivity of the optical system used in the schlieren setup in determining the quality of the recorded information. This sensitivity depends on the coherence of the light source and the use of a laser as such a source will constitute a significant improvement in schlieren system effectiveness. The evaluation of a laser beam schlieren system in a 20-in. Mach 14 wind tunnel is discussed. Several practical limitations of schlieren systems which become more critical when lasers are used are reviewed. These are imposed by imperfections in the optical components by fluctuations of the refractive index of air along the light path and by mechanical vibrations. S. Z.

**A67-14676 #****LASER RADAR RETURNS FROM THE LOWER TROPOSPHERE COMPARED WITH VERTICAL OZONE DISTRIBUTIONS.**

Duane A. Lea, James L. Karney, and Cecil A. Knudsen (U.S. Navy, Pacific Missile Range, Point Mugu, Calif.).

IN: AMERICAN METEOROLOGICAL SOCIETY, CONFERENCE ON RADAR METEOROLOGY, 12TH, UNIVERSITY OF OKLAHOMA, NORMAN, OKLA., OCTOBER 17-20, 1966, PROCEEDINGS. [A67-14672 04-20]

Boston, American Meteorological Society, 1966, p. 98-101. 8 refs.

Preliminary comparison of laser radar returns with vertical ozone distributions in the lower troposphere, based mainly on a 1965 series of ozone soundings, conducted at Point Mugu, and on laser firings. The comparison suggests an inverse relationship, especially in smoggy air advected from the nearby Los Angeles basin. En route to the observing site, the ozone content of the polluted air is presumably depleted in discrete layers by destructive contact with stratified layers of aerosol and cloud from which the laser pulses are backscattered. Differences in observing paths and times, as well as accuracy limitations of the instrumental methods, preclude rigorous analysis of the present data, and resulting conclusions are admittedly speculative. S. Z.

**A67-14677 #****LASER BACKSCATTER SIGNATURES AND TRANSMISSIVITY OVER HORIZONTAL AND SLANT PATHS.**

Richard T. Brown, Jr. (Sperry Rand Corp., Sperry Rand Research Center, Sudbury, Mass.).

IN: AMERICAN METEOROLOGICAL SOCIETY, CONFERENCE ON RADAR METEOROLOGY, 12TH, UNIVERSITY OF OKLAHOMA, NORMAN, OKLA., OCTOBER 17-20, 1966, PROCEEDINGS. [A67-14672 04-20]

Boston, American Meteorological Society, 1966, p. 105-111. 10 refs. Contract No. FA-65-WA-1315.

Investigation of the correlation between laser backscatter and transmissivity from the standpoint of slant-path measurements. The experimental results are believed to constitute evidence of a promising technique for measuring the extinction coefficients of fogs or other scattering media which restrict visibility. The experimental results verify the following theoretical predictions: (1) the width of the pulse-shaped backscatter display decreases as the extinction coefficient increases, (2) the distance-to-peak backscatter return decreases as the extinction coefficient increases, and (3) the slope of the decay portion of the backscatter display becomes more negative as the extinction coefficient increases. M. M.

**A67-14722****A MECHANISM ENSURING LEVEL POPULATION INVERSION IN CO<sub>2</sub> LASERS.**

N. N. Sobolev and V. V. Sokovikov (Akademii Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(ZHETF Pis'ma v Redaktsiiu, vol. 4, Oct. 15, 1966, p. 303-307.) JETP Letters, vol. 4, Oct. 15, 1966, p. 204-207. 8 refs. Translation.

[For abstract see issue 03, category 16, Accession no. A67-13297]

**A67-14745 #****THE TWO-PHOTON LASER [O DVUKHFOTONNOM LAZERE].**

T. M. Il'inova (Moskovskii Gosudarstvennyi Universitet, Kafedra Fiziki Kolebani, Moscow, USSR).

Moskovskii Universitet, Vestnik, Seriya III - Fizika, Astronomiia, vol. 21, Sept.-Oct. 1966, p. 39-47. 5 refs. In Russian.

Theoretical analysis of the steady-state regime and stability of a two-photon laser. Resonance excitation curves are plotted for the steady-state oscillations, and the nonstationary processes are discussed showing that the intensity and duration of a frequency pulse emitted by an excited two-photon laser are essentially dependent on the field. The structural characteristics of a frequency pulse are determined. V. Z.

**A67-14763 #****CONSTRUCTION OF SINGLE-MODE D.C. OPERATED He/Ne LASERS.**

J. V. Ramsay and K. Tanaka (Commonwealth Scientific and Industrial Research Organization, Div. of Physics, National Standards Laboratory, Sydney, Australia).

Japanese Journal of Applied Physics, vol. 5, Oct. 1966, p. 918-923. 8 refs.

Methods of construction of dc-operated He/Ne laser tubes using optical contact bonds are described. Optimum values of various parameters for operation at 632.8 nm have been established and a robust single-mode laser is described which is very suitable for use as a light source in interferometry. It is relatively easy to construct and can be dismantled for major maintenance such as refilling. (Author)

**A67-14764 #****TUNABLE INFRARED MASER SPECTROMETERS.**

Katsumi Sakurai and Koichi Shimoda (Tokyo, University, Dept. of Physics, Tokyo, Japan).

Japanese Journal of Applied Physics, vol. 5, Oct. 1966, p. 938-947. 11 refs.

Magnetically tunable IR masers of He-Xe at 3.5070  $\mu$  and He-Ne at 3.3913  $\mu$  are described. Basic considerations and experimental problems in applying a tunable infrared maser to infrared spectroscopy are discussed. Theoretical discussions of the sensitivity and the resolution of the infrared maser spectrometer are presented. By using a small solenoid, the He-Xe maser was tuned in the range of about  $\pm 4000$  MHz and the He-Ne maser was tuned about  $\pm 2000$  MHz. Absorption spectra of some organic molecules were observed by the Stark-modulation as well as by the video method. Single-pass gains of the He-Xe and the He-Ne discharge were measured by the signal from tunable masers. An asymmetry in the output power of the He-Xe maser against scanning magnetic field can be explained from the observed hyperfine component of the maser transition of Xe. (Author)

**A67-14765 #****TIME VARIATIONS OF STIMULATED RAMAN PROCESS AND EFFECT OF RELAXATION.**

Tadao Shimizu (Institute of Physical and Chemical Research, Microwave Physics Laboratory, Tokyo, Japan) and Fujio Shimizu (Tokyo, University, Dept. of Physics, Tokyo, Japan).

Japanese Journal of Applied Physics, vol. 5, Oct. 1966, p. 948-956. 5 refs.

Stimulated Stokes emissions from Raman active media (CS<sub>2</sub> and C<sub>6</sub>H<sub>6</sub>) have been observed by using a Q-switched ruby laser, which emits a multiple-pulse in each shot. A relation between intensities of the laser pulses and the corresponding stimulated Stokes pulses is not expressed by a simple proportion, because a certain relaxation phenomenon occurs in the Raman medium. The pulse shape of the laser light after transmission through the Raman medium also shows some asymmetric structure under the influence of the relaxation. Neither shock wave propagation nor a bubble produced by the laser beam is a possible origin of the observed effect. A saturation of transition between the vibrational levels by the stimulated Raman process is one of the plausible sources of the temporal variations of this process. The calculation is found to account for the observations. (Author)

**A67-14913**

OBSERVATION OF DEGENERATE MODES WITH A GAS LASER  
[OBSERVATION DE MODES DEGENERES AVEC UN LASER A GAZ].  
Roger Der Agobian (Laboratoire Central de Télécommunications,  
Paris, France).

Académie des Sciences (Paris), Comptes Rendus, Série B -  
Sciences Physiques, vol. 263, no. 19, Nov. 7, 1966, p. 1064-1066.  
5 refs. In French.

Extension of the work of Collins and Giordmaine in which there were observed in ruby and Nd-glass lasers oscillation modes with emission directions which are clearly separated and deviate several degrees from the axis. Experiments were conducted and are described which seem to establish that oblique modes can develop in a gas laser and carry a nonnegligible fraction of the energy of the beam. M. F.

**A67-14914**

ADDITION IN TELLURIUM OF TWO RADIATIONS EMITTED BY A CO<sub>2</sub> LASER [ADDITION, DANS LE TELLURE, DE DEUX RAYONNEMENTS PRODUITS PAR UN LASER CO<sub>2</sub>].

Jean Jerphagnon, Marcelle Sourbe, and Edmond Batifol (Centre National d'Etudes des Télécommunications, Département Physique-Chimie-Métallurgie, Issy-les-Moulineaux, Seine, France).

Académie des Sciences (Paris), Comptes Rendus, Série B -  
Sciences Physiques, vol. 263, no. 19, Nov. 7, 1966, p. 1067-1070.  
5 refs. In French.

Discussion of experiments in which a single crystal of tellurium was pumped by two waves emitted by a CO<sub>2</sub> laser to produce a third wave. The two waves used had the same wavelengths (10.6  $\mu$ ) and different directions. The variation of the nonlinear properties of tellurium in the temperature range 78 to 300°K is examined. M. F.

**A67-14927 #**

PUMPING INDUCED IMPERFECTIONS IN GLASS:Nd<sup>3+</sup> LASERS.

L. I. van Torne (Martin Marietta Corp., Martin Co., Materials Research Laboratory, Orlando, Fla.).

Physica Status Solidi, vol. 16, no. 1, 1966, p. 171-182. 20 refs.

A barium crown glass:Nd<sup>3+</sup> laser rod which developed permanent internal imperfections during laser pumping was investigated by optical metallography, transmission electron microscopy, and electron diffraction techniques. The imperfections were found to be microcracks resulting from differential thermal expansion between crystallites (resulting from devitrification) and the surrounding noncrystalline medium. An analysis of the kinetics of devitrification, the radial temperature distribution during pumping and stresses resulting from differential thermal expansion are in agreement with a proposed mechanism for the development of permanent internal imperfections. (Author)

**A67-14949**

QUANTUM THEORY OF NOISE IN GAS AND SOLID STATE LASERS WITH AN INHOMOGENEOUSLY BROADENED LINE. I.

V. Arzt, H. Haken, H. Risken, H. Sauerbmann, Ch. Schmid, and W. Weidlich (Stuttgart, Technische Hochschule, Institut für theoretische und angewandte Physik, Stuttgart, West Germany).

Zeitschrift für Physik, vol. 197, no. 3, 1966, p. 207-227. 39 refs.

Quantum mechanical nonlinear treatment of the phase and amplitude fluctuations of gas and solid lasers with an inhomogeneously broadened line. The atoms may possess an arbitrary number of levels. The noise due to the pump, incoherent decay, lattice vibrations or atomic collisions, as well as due to the thermal and zero-point fluctuations of the cavity is completely taken into account. The results obtained apply to the whole threshold region and above up to essentially the same photon number to which the previous semiclassical theories of inhomogeneously broadened lasers were applicable. A technique for the rigorous elimination of the atomic variables which yields a set of nonlinear coupled equations for the light-field operators alone is demonstrated for the case of a two-level system. M.M.

**A67-15076**

PHASE AND AMPLITUDE MEASUREMENTS OF COHERENT OPTICAL WAVEFRONTS.

Joseph T. Ruscio (Bell Telephone Laboratories, Inc., Crawford Hill Laboratory, Holmdel, N.J.).

Bell System Technical Journal, vol. 45, Nov. 1966, p. 1583-1597. 5 refs.

A phase-locked laser loop has been used as an amplitude and phase measuring device for coherent optical wavefronts. A relative phase resolution on the order of 1° and an amplitude resolution accurate to 1 db or better were obtained. The system and measuring techniques used are described, and the results obtained are illustrated by several examples. (Author)

**A67-15099**

KINETIC ENERGIES OF IONS PRODUCED BY LASER GIANT PULSES.

David W. Gregg and Scott J. Thomas (California, University, Lawrence Radiation Laboratory, Livermore, Calif.).

Journal of Applied Physics, vol. 37, Nov. 1966, p. 4313-4316. 6 refs.

AEC-sponsored research.

Kinetic energies of ions produced by focusing laser giant pulses on surfaces of Li, LiH, Be, C, Al, S, Zn, and Ag were measured. The mean-squared ion velocity and the velocity squared of the highest-energy ions detected are presented as a function of laser giant pulse peak intensity. The mean squared ion velocity increased proportionally to approximately the square root of the giant pulse peak intensity for the lower atomic weight materials, and varied with approximately the 0.33 power of the intensity for the higher atomic weight materials. Average ion kinetic energies as high as 2000 ev were detected. (Author)

**A67-15100**

OPTICAL AVALANCHE LASER.

C. G. Young, J. W. Kantorski, and E. O. Dixon (American Optical Co., Southbridge, Mass.).

(Conference on Laser Technology, 2nd, Illinois Institute of Technology, Chicago, Ill., Apr. 1965, Paper.)

Journal of Applied Physics, vol. 37, Nov. 1966, p. 4319-4324. 13 refs.

ARPA-DOD-Navy-sponsored research.

A neodymium-glass laser device is described which employs amplified spontaneous emission in a nonresonant system to obtain a high brightness output pulse. The spontaneous avalanche obtained was in a 70-nsec pulse of approximately 1-Gw power confined to a 1-mrad-full-angle beam. The output brightness was sufficient to produce unfocused air breakdown. Included are design criteria and an analysis of the characteristics of the avalanche pulse. (Author)

**A67-15109**

ELECTRON RECOMBINATION IN LASER-PRODUCED HYDROGEN PLASMA.

M. M. Litvak and David F. Edwards (Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.).

Journal of Applied Physics, vol. 37, Nov. 1966, p. 4462-4474. 53 refs.

Time-resolved spectroscopic measurements were made of the decay of a laser-produced discharge in hydrogen over a range of pressures from 1 to 70 atm. Stark widths and line-to-continuum intensity ratios yielded the electron density, and temperature time history, which indicated temperature decay because of radiation, and expansion cooling and electron loss because of collisional-radiative recombination, as verified by solutions obtained from the rate and energy equations. (Author)

**A67-15110**

INFLUENCE OF PLASMA-TUBE-SURFACE INTERACTION ON THE HELIUM-NEON LASER LIFETIME.

J. V. Martinez (Xerox Corp., Rochester, N.Y.).

(American Physical Society, Meeting, New York, N.Y., June 1965, Paper; American Physical Society, Bulletin, vol. 10, 1965.)

Journal of Applied Physics, vol. 37, Nov. 1966, p. 4477-4483. 32 refs.

Results here presented indicate that the surface of a fused silica tube is decomposed as a result of bombardment by neon ions produced in an rf helium-neon laser discharge. The decomposition products are oxygen and a reduced form of silica. The concentration of oxygen released is sufficient to contaminate a helium-neon laser mixture and prevent laser action. Evidence shows that in the preliminary stages of the decomposition  $E_1'$  centers are produced. The various stages in the erosion of the tube surface are shown by means of electron micrographs. (Author)

**A67-15111****SATURATION AND GAIN OF GAS LASERS FROM MODULATION EXPERIMENTS.**

P. T. Bolwijn (Utrecht, Rijksuniversiteit, Fysisch Laboratorium, Utrecht, Netherlands).

(1966 International Quantum Electronics Conference, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

Journal of Applied Physics, vol. 37, Nov. 1966, p. 4487-4492. 24 refs.

It is shown theoretically that an analysis of single mode output power modulation, obtained via excitation density or via resonator Q modulation is a very sensitive method for studying both the unsaturated net gain and the saturation behavior of gas laser transitions. This theoretical description starts from the theory of Lamb. Experiments with excitation density modulation in a 1.15- $\mu$  He-Ne laser are reported. The output power modulation as a function of the detuning of the resonator, which yields information on the saturation behavior, is found to agree partly with the theory if collision effects are taken into account. Deviations from the theory may be due to higher-order saturation terms, which is shown qualitatively by starting from the extended theory of Lamb, derived by Uehara and Shimoda. A detailed quantitative explanation of the observations at higher excitation levels awaits incorporation of collision effects in the higher-order saturation terms. The output power modulation as a function of modulation frequency may give information on the unsaturated net gain. In our case, however, the frequency response is determined by the long metastable lifetimes of He. (Author)

**A67-15132 #**

**THE CHANGE IN THE CURRENT VOLTAGE CHARACTERISTIC OF A GaAs QUANTUM GENERATOR DURING THE TRANSITION FROM AMPLIFICATION TO GENERATION [IZMENENIE KHKAKTERISTIKI TOK-NAPRIAZHENIE GaAs KVANTOVOGO GENERATORA PRI PEREKHODE OT USILENIA IZLUCHEENIA K REZHIMU GENERATSII].**

B. I. Gladkii, D. N. Nasledov, and B. V. Tsarenkov (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR).

Fizika Tverdogo Tela, vol. 8, Nov. 1966, p. 3282-3287. In Russian.

Detailed study of the current-voltage characteristic of a GaAs diode with a Fabry-Pérot resonator at currents corresponding to the transition from amplification to generation. It is shown that the current-voltage characteristic of a GaAs quantum generator is linear when  $V > E_g/q$ , where  $E_g$  is the width of the forbidden band of GaAs and  $q$  is the electron charge, but suffers a discontinuity during the transition from amplification to generation and then becomes linear again - i.e., during the transition the differential residual resistance changes almost abruptly and does not depend on the current before or after the onset of generation. An explanation for this phenomenon is given. A.B.K.

**A67-15139 #**

**MAGNETOOPTICAL MODULATION OF THE INFRARED EMISSION OF A GAS LASER [MAGNETOOPTICHESKAIA MODULIATSIIA INFRAKRASNOGO IZLUCHEENIA GAZOVOGO LAZERA].**

M. V. Chetkin and V. S. Solomatina (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR).

Fizika Tverdogo Tela, vol. 8, Nov. 1966, p. 3388-3390. 5 refs. In Russian.

Study of the magnetooptical modulation of the IR emission of an He-Ne gas laser, using the Faraday effect in pulsed or rapidly varying magnetic fields. A description is given of a method of observing the change in the intensity of the IR laser emission emerging from a magnetized ferrite garnet single crystal placed in the path of the laser beam and subjected to alternating magnetization. A.B.K.

**A67-15158 #**

**A TWO-LEVEL SOLID-STATE QUANTUM GENERATOR AND AMPLIFIER IN THE 8-MM RANGE WITH A HIGH RECURRENT INVERSION FREQUENCY [DVUKHUROVNEVYI KVANTOVYI GENERATOR I USILITEL' 8-MM DIAPAZONA NA TVERDOM TELE S POVYSHENNOI REKURRENTNOI CHASTOTOI INVERSI].**

Ia. L. Shamfarov (Akademiia Nauk Ukrainskoi SSR, Institut Radiofiziki i Elektroniki, Kharkov, Ukrainian SSR).

Radiotekhnika i Elektronika, vol. 11, Nov. 1966, p. 2044-2052. 7 refs. In Russian.

Experimental study of a two-level, resonator-type, quantum paramagnetic amplifier and generator operating at a frequency of 37,200 Mc, using a neutron-irradiated quartz single crystal at a temperature of 4.2°K as the active material. Population inversion of the spin system is achieved by the method of fast adiabatic transmission. In the self-oscillating regime a power of 100  $\mu$ w is obtained in an emission time of 70  $\mu$ sec, while in the amplification regime an amplification factor-bandwidth product of 22 Mc is achieved at a bandwidth of 2 Mc. Using the method of repeated inversion, the recurrent inversion frequency is increased from 10 to 50 cps for  $\tau/T_1 = 5 \times 10^{-2}$ , where  $\tau$  is the active operating time of the amplifier, and  $T_1$  is the spin-lattice relaxation time. It is established that the spin-lattice relaxation time on F-centers in quartz increases with an increase in the magnetic field at 4.2°K approximately as  $T_1 \sim H_0^{0.8}$ . A.B.K.

**A67-15200**

**POSSIBILITY OF MASER ACTION IN COSMIC RADIO SOURCES.**

Richard McCray (California, University, Space Science Center, Los Angeles, Calif.).

Science, vol. 154, Dec. 9, 1966, p. 1320-1323. 36 refs.

Description of a mechanism for maser action in sources of synchrotron radiation. It is shown that under certain circumstances negative absorption can occur in sources of synchrotron radiation. This conclusion differs from previous ones of a similar nature in that the effect of an ambient plasma on the synchrotron radiation is taken into account. It is shown that the proposed negative-absorption process may contribute to the low-frequency radiation from 3C 273B. A.B.K.

**A67-15299**

**SEMICONDUCTOR CdSe LASER WITH TWO-PHOTON OPTICAL EXCITATION.**

A. Z. Grasiuk, V. F. Efimkov, I. G. Zubarev, V. A. Katulin, and A. N. Mentser (Akademiia Nauk SSSR, Fizicheskii Institut, Moskovskii Institut Stali i Splavov, Moscow, USSR).

(Fizika Tverdogo Tela, vol. 8, June 1966, p. 1953, 1954.)

Soviet Physics - Solid State, vol. 8, Dec. 1966, p. 1548, 1549.

Translation.

[For abstract see issue 20, page 3578, Accession no. A66-37565]

**A67-15300**

**ANNUAL ELECTRON AND LASER BEAM SYMPOSIUM, 8TH, UNIVERSITY OF MICHIGAN, ANN ARBOR, MICH., APRIL 6-8, 1966, PROCEEDINGS.**

Symposium sponsored by the University of Michigan, and the Institute of Electrical and Electronics Engineers.

Edited by G. I. Haddad (Michigan, University, Ann Arbor, Mich.). Ann Arbor, University of Michigan, 1966. 520 p. \$20.

**CONTENTS:**

PREFACE. Joseph E. Rowe (Michigan, University, Ann Arbor, Mich.), p. iii, iv.

FOREWORD. G. I. Haddad (Michigan, University, Ann Arbor, Mich.), p. v.

WAVEFRONT RECONSTRUCTION OR "HOLOGRAPHY."

Dennis Gabor (London, University, London, England), p. 1-19.

[See A67-15301 04-14]

RECENT RESULTS IN HOLOGRAPHY. E. N. Leith (Michigan, University, Ann Arbor, Mich.), p. 21-37. 12 refs. [See A67-15302 04-14]

THE USE OF LASERS IN SIGNAL PROCESSING FOR RADAR AND COMMUNICATIONS. L. J. Cutrona (Michigan, University, Ann Arbor, Mich.), p. 39-85. 25 refs. [See A67-15303 04-07]

AIRBORNE INVESTIGATIONS OF CLEAR AIR TURBULENCE WITH LASER RADARS. P. A. Franken, J. A. Jenney, and D. M. Rank (Michigan, University, Ann Arbor, Mich.), p. 87-103. 5 refs. [See A67-15304 04-20]

ZAPPING PAPER. Jon H. Myer (Hughes Aircraft Co., Newport Beach, Calif.), p. 105, 106.

THE APPLICATION OF LASERS IN THERMOPHYSICAL PROPERTIES MEASUREMENTS. M. M. Nakata (North American Aviation, Inc., Canoga Park, Calif.), p. 107-115. 10 refs. [See A67-15305 04-14]

VANADIUM CHARGE COMPENSATOR SITE IN LASER  $\text{CaWO}_4$ . C. Kikuchi, N. Mahootian (Michigan, University, Ann Arbor, Mich.), W. Viehmann, and R. T. Farrar (U.S. Army, Materiel Command, Washington, D.C.), p. 117-138. 16 refs. [See A67-15306 04-16]

THE EFFECT OF INTERNAL REFLECTION IN A CORNER CUBE UPON THE POLARIZATION OF A REFLECTED BEAM. Peter J. Walsh and Irvin Krause (Fairleigh Dickinson University, Rutherford, N.J.), p. 139-155. 5 refs. [See A67-15307 04-23]

LASER MACHINING STUDY. Warren V. Trammell (General Motors Corp., Santa Barbara, Calif.), p. 157-186. [See A67-15308 04-15]

THE LASER NOW A PRODUCTION TOOL. J. P. Epperson, R. W. Dyer (Western Electric Co., Inc., Princeton, N.J.), and J. C. Grzywa (Western Electric Co., Inc., Buffalo, N.Y.), p. 187-205. 5 refs. [See A67-15309 04-15]

DESIGN OF A PRODUCTION-WORTHY LASER MICROWELDER. Jon H. Myer (Hughes Aircraft Co., Newport Beach, Calif.), p. 207-215. [See A67-15310 04-15]

THE ANNULAR HOLLOW CATHODE - ITS OPERATION AND APPLICATIONS. J. W. Davis, A. P. Walch, and E. A. Pinsley (United Aircraft Corp., East Hartford, Conn.), p. 217-231. 7 refs. [See A67-15311 04-15]

PRELIMINARY EVALUATION OF A NONVACUUM WELDER FOR AEROSPACE APPLICATIONS. J. Lempert, J. F. Lowry, C. S. Williams, and F. D. Seaman (Westinghouse Electric Corp., Pittsburgh, Pa.), p. 233-257. [See A67-15312 04-15]

TRANSITION OF ELECTRON BEAM WELDING FROM HARD VACUUM TO SOFT VACUUM. H. A. James and J. L. Solomon (Sciaky Bros., Inc., Chicago, Ill.), p. 259-278. [See A67-15313 04-15]

PROPERTY CHANGES INDUCED BY ELECTRON BEAM EXPOSURE IN VARIOUS SEMICONDUCTOR AND DIELECTRIC MATERIALS. David R. Sivertsen, Olin B. Cecil, and Rolf R. Haberecht (Texas Instruments, Inc., Dallas, Tex.), p. 279-318. 15 refs. [See A67-15314 04-26]

ELECTRON-BEAM EVAPORATION OF SILICON DIOXIDE AS A STORAGE LAYER FOR THE RCA AUTOMATIC-PICTURE-TRANSMISSION VIDICON. D. W. Roe (Radio Corporation of America, Lancaster, Pa.), p. 319-330. 5 refs. [See A67-15315 04-14]

A PULSED MACHINE-SCAN ELECTRON BEAM DEVICE. A. B. El-Kareh, R. B. Fair, and C. R. Marsh (Pennsylvania State University, University Park, Pa.), p. 331-356. 11 refs. [See A67-15316 04-14]

APPLICATIONS OF THE BARRIER ELECTRON VOLTAIC EFFECT. C. Munakata (Hitachi, Ltd., Tokyo, Japan), p. 357-374. 14 refs. [See A67-15317 04-09]

A METHOD OF EXAMINATION OF SEMICONDUCTOR OXIDES WITH A SCANNING ELECTRON MICROSCOPE. D. Green (Westinghouse Electric Corp., Pittsburgh, Pa.), p. 375-384. [See A67-15318 04-26]

ELECTRON BEAM SYNTHESIS AND CRYSTALLIZATION OF  $\text{InSb}$  FILMS. N. M. Davis and H. H. Wieder (U.S. Naval Ordnance Laboratory, Corona, Calif.), p. 385-398. 10 refs. [See A67-15319 04-26]

$\text{Al}_2\text{O}_3$  SINGLE CRYSTAL GROWTH BY ELECTRON BEAM FLOAT-ZONE MELTING. Walter Class and Harvey R. Nesor (Materials Research Corp., Orangeburg, N.Y.), p. 399-413. 8 refs. [See A67-15320 04-15]

DIFFRACTION-LIMITED SPOT SCANNING. Samuel Bousky (Ampex Corp., Redwood City, Calif.), p. 415-427. [See A67-15321 04-14]

DIFFRACTION LIMITED CONCENTRIC OPTICS. E. K. Thorburn (Optical Instruments Corp., Buena Park, Calif.), p. 429-435. [See A67-15322 04-23]

THE PRODUCTION AND USE OF MONOENERGETIC ELECTRON BEAMS. J. Arol Simpson (National Bureau of Standards, Washington, D.C.), p. 437-447. 14 refs. [See A67-15323 04-14]

MECHANISM OF ENERGY RELAXATION IN ELECTRON BEAMS. Kurt Ulmer and Bodo W. Zimmermann (Karlsruhe, Technische Hochschule, Karlsruhe, West Germany), p. 449-463. [See A67-15324 04-14]

TECHNIQUES FOR THE STUDY OF SELF-FOCUSING ELECTRON STREAMS. S. E. Graybill and S. V. Nablo (Ion Physics Corp., Burlington, Mass.), p. 465-486. 11 refs. [See A67-15325 04-14]

THE QUEST FOR SUPERDENSE ELECTRON BEAMS. W. E. Waters (Varian Associates, Palo Alto, Calif.), p. 487-504. [See A67-15326 04-14]

AN ELECTRON ACCELERATOR WITH A PEAK BEAM POWER OF  $10^{10}$  WATTS. W. P. Dyke, J. P. Barbour, F. J. Grundhauser, and F. M. Charbonnier (Field Emission Corp., McMinnville, Ore.), p. 505-520. 13 refs. [See A67-15327 04-11]

#### A67-15303 #

THE USE OF LASERS IN SIGNAL PROCESSING FOR RADAR AND COMMUNICATIONS.

L. J. Cutrona (Michigan, University, Dept. of Electrical Engineering; Conduction Corp., Ann Arbor, Mich.).

IN: ANNUAL ELECTRON AND LASER BEAM SYMPOSIUM, 8TH, UNIVERSITY OF MICHIGAN, ANN ARBOR, MICH., APRIL 6-8, 1966, PROCEEDINGS. [A67-15300 04-14]

Symposium sponsored by the University of Michigan, and the Institute of Electrical and Electronics Engineers.

Edited by G. I. Haddad.

Ann Arbor, University of Michigan, 1966, p. 39-85. 25 refs.

Review of the basic ideas concerning the use of lasers in a large variety of signal-processing optical equipments. The ideas are applied to a number of problems in radar processing and communications signal processing. The major ideas involving the use of optics for radar are applied to the process of generating a synthetic antenna giving a resolution significantly finer than that of a radiated beamwidth. In the application of optics to communications, it is shown that many of the coding-decoding and synchronization operations can be mechanized optically. M.M.

#### A67-15304 #

AIRBORNE INVESTIGATIONS OF CLEAR AIR TURBULENCE WITH LASER RADARS.

P. A. Franken, J. A. Jenney, and D. M. Rank (Michigan, University, Dept. of Physics, Ann Arbor, Mich.).

IN: ANNUAL ELECTRON AND LASER BEAM SYMPOSIUM, 8TH, UNIVERSITY OF MICHIGAN, ANN ARBOR, MICH., APRIL 6-8, 1966, PROCEEDINGS. [A67-15300 04-14]

Symposium sponsored by the University of Michigan, and the Institute of Electrical and Electronics Engineers.

Edited by G. I. Haddad.

Ann Arbor, University of Michigan, 1966, p. 87-103. 5 refs.

Contract No. Nonr-1224(51).

Experimental investigation of the possibility that characteristic optical radar echoes might actually be correlated with clear-air turbulence. Over 1300 experiments were performed with a laser radar mounted in a light twin-engine aircraft flying in severe storm areas. The ancillary equipment used included an accelerometer, a thermistor, data-recording equipment, and a forward-looking camera for recording the local meteorology. The results showed that in each area approximately 90% of the experiments failed to reveal either peculiar aerosol distributions or turbulence. Of the remaining 10%, however, roughly one-third exhibited turbulence and no interesting aerosol effects, one-third exhibited interesting aerosol distributions but no turbulence, and the remaining third exhibited both effects concurrently. M.M.

#### A67-15305 \* #

THE APPLICATION OF LASERS IN THERMOPHYSICAL PROPERTIES MEASUREMENTS.

## A67-15308

M. M. Nakata (North American Aviation, Inc., Atomics International Div., Canoga Park, Calif.).  
IN: ANNUAL ELECTRON AND LASER BEAM SYMPOSIUM, 8TH, UNIVERSITY OF MICHIGAN, ANN ARBOR, MICH., APRIL 6-8, 1966, PROCEEDINGS. [A67-15300 04-14]  
Symposium sponsored by the University of Michigan, and the Institute of Electrical and Electronics Engineers.  
Edited by G. I. Haddad.

Ann Arbor, University of Michigan, 1966, p. 107-115. 10 refs.  
NASA-supported research; AEC Contract No. AT (11-1)-GEN-8.

Discussion of the application of a ruby laser as the pulsed energy source for the flash technique of measuring the thermophysical properties of materials. The advantages and limitations of its application, as well as other related problems, are treated, and the results of measurements are given. Solutions to most of the difficulties related to the technique have been found, and measurements made on numerous materials have been shown to agree well with literature values. Although the measurement of heat capacity using the flash technique presents numerous problems, the potential usefulness of this method warrants further efforts.

M.M.

## A67-15308 #

### LASER MACHINING STUDY.

Warren V. Trammell (General Motors Corp., Defense Research Laboratories, Santa Barbara, Calif.).  
IN: ANNUAL ELECTRON AND LASER BEAM SYMPOSIUM, 8TH, UNIVERSITY OF MICHIGAN, ANN ARBOR, MICH., APRIL 6-8, 1966, PROCEEDINGS. [A67-15300 04-14]  
Symposium sponsored by the University of Michigan, and the Institute of Electrical and Electronics Engineers.  
Edited by G. I. Haddad.

Ann Arbor, University of Michigan, 1966, p. 157-186.  
Research sponsored by the General Motors Corp.

The report presents the results of an experimental program to define the current status of pulsed lasers as machine tools for material removal. The laser machining systems used for the tests were sufficiently flexible so that an extensive study could be made of the effects of energy, power, pulse duration, beam divergence and focusing of the beam on machining capability. The machining tests were limited to the following materials: Rene-41, Inconel 713, L-605, Titanium 6-4, aluminum oxide, Hastelloy X, C-2 carbide, Stellite 19, and D-6 steel. The smallest diameter hole obtained was 0.0035 in. The largest area vaporized and ejected was 0.104 in. in diameter. The deepest hole drilled with a single pulse was 0.183 in. and with multiple pulses was 0.402 in. The depth of multiple pulse holes was limited by metal resolidification to a depth-diameter ratio of 5 to 10 depending on the work material. Grooves up to 0.080 in. wide and 0.170 in. deep were formed by overlapping single pulses. All drilled holes had resolidified surface layers approximately 0.001 in. thick in which microstructural changes had occurred.

(Author)

## A67-15309 #

### THE LASER NOW A PRODUCTION TOOL.

J. P. Epperson, R. W. Dyer (Western Electric Co., Inc., Princeton, N.J.), and J. C. Grzywa (Western Electric Co., Inc., Buffalo, N.Y.).

IN: ANNUAL ELECTRON AND LASER BEAM SYMPOSIUM, 8TH, UNIVERSITY OF MICHIGAN, ANN ARBOR, MICH., APRIL 6-8, 1966, PROCEEDINGS. [A67-15300 04-14]  
Symposium sponsored by the University of Michigan, and the Institute of Electrical and Electronics Engineers.  
Edited by G. I. Haddad.

Ann Arbor, University of Michigan, 1966, p. 187-205. 5 refs.

Description of a laser system which made diamond piercing possible, and a closed-circuit television viewing system that made it practical. Operator safety is of paramount importance and was considered carefully in the design of all components of the production machine and in its installation. The production results for initially drilling virgin die stones are summarized. The 33-mm focal length of the objective lens focuses the laser beam to a spot with a diameter of 0.010 in., resulting in an energy density of  $1.84 \times 10^4$  joules/cm<sup>2</sup>.

M.M.

## A67-15310 #

### DESIGN OF A PRODUCTION-WORTHY LASER MICROWELDER.

Jon H. Myer (Hughes Aircraft Co., Newport Beach, Calif.).  
IN: ANNUAL ELECTRON AND LASER BEAM SYMPOSIUM, 8TH, UNIVERSITY OF MICHIGAN, ANN ARBOR, MICH., APRIL 6-8, 1966, PROCEEDINGS. [A67-15300 04-14]  
Symposium sponsored by the University of Michigan, and the Institute of Electrical and Electronics Engineers.

Edited by G. I. Haddad.

Ann Arbor, University of Michigan, 1966, p. 207-215.

The evolutionary steps in the design and construction of a production-worthy, safe, and economical laser microwelder are described. A novel, modular, liquid-cooled, cylindrical ruby laser head as well as a novel method of adjustment of the location of the welding focal plane are described.

(Author)

## A67-15321 #

### DIFFRACTION-LIMITED SPOT SCANNING.

Samuel Bousky (Ampex Corp., Redwood City, Calif.).  
IN: ANNUAL ELECTRON AND LASER BEAM SYMPOSIUM, 8TH, UNIVERSITY OF MICHIGAN, ANN ARBOR, MICH., APRIL 6-8, 1966, PROCEEDINGS. [A67-15300 04-14]  
Symposium sponsored by the University of Michigan, and the Institute of Electrical and Electronics Engineers.  
Edited by G. I. Haddad.

Ann Arbor, University of Michigan, 1966, p. 415-427.

Examination of the dependence of data record and readout systems, utilizing diffraction-limited spots of laser-generated light, on precise spot and line scan methods. Ideal linear scan is accomplished by four geometric configurations within three basic scanning techniques. Practical system capabilities for focused spot scanning by mechanical rotation at bandwidths to 100 MHz, line rates of 10 kHz, and line lengths to 20,000 spot diameters are given.

S.Z.

## A67-15322 #

### DIFFRACTION LIMITED CONCENTRIC OPTICS.

E. K. Thorburn (Optical Instruments Corp., Buena Park, Calif.).  
IN: ANNUAL ELECTRON AND LASER BEAM SYMPOSIUM, 8TH, UNIVERSITY OF MICHIGAN, ANN ARBOR, MICH., APRIL 6-8, 1966, PROCEEDINGS. [A67-15300 04-14]  
Symposium sponsored by the University of Michigan, and the Institute of Electrical and Electronics Engineers.  
Edited by G. I. Haddad.

Ann Arbor, University of Michigan, 1966, p. 429-435.  
USAF-supported research.

Discussion of some novel applications of a concentric optical system to achieve diffraction-limited performance for flying spot recording and readout. In the specific case of laser scanner systems, the performance can be truly diffraction-limited. A system resembling a collimated beam scanner was designed. The design aberrations were  $1/25\lambda$ . Practical problems associated with introduction of multiple beams onto a flat-faced scanning prism resulted in a degradation of the design performance to  $1/10\lambda$ . Possible applications to a unique infrared optical system are also considered.

S.Z.

## A67-15371 #

### MULTI-GIGAWATT RUBY LASER SYSTEM.

William C. O'Neal (California, University, Lawrence Radiation Laboratory, Mechanical Engineering Dept., Propulsion Div., Physics Experiments Section, Livermore, Calif.).  
American Society of Mechanical Engineers, Winter Annual Meeting and Energy Systems Exposition, New York, N.Y., Nov. 27-Dec. 1, 1966, Paper 66-WA/ENER-2, 8 p. 5 refs.  
Members, \$0.75; nonmembers, \$1.50.  
AEC-sponsored research.

A multi-gigawatt ruby laser system has been designed and built at the University of California, Lawrence Radiation Laboratory, at Livermore. The multihead, oscillator-amplifier system is built around Brewster-ended rubies  $1/2$  in. in diameter by 3 in.-long. The oscillator output is 1 joule/cm<sup>2</sup>. This output is divided by a beam splitter and then directed by prisms through collimating lenses, preamplifiers, prisms, beam splitters, and 12 final amplifiers. The system is to be used for experiments in high-temperature plasma research.

(Author)

**A67-15455 #****THE DESIGN OF LASER INTERFEROMETERS FOR USE IN FLUID MECHANICS.**

L. H. Tanner (Belfast, Queen's University, Dept. of Aeronautical Engineering, Belfast, Northern Ireland).

*Journal of Scientific Instruments*, vol. 43, Dec. 1966, p. 878-886. 28 refs.

Discussion of the factors bearing upon the choice of laser interferometers for use in fluid mechanics. The various interferometer types are classified, and their principles of operation are explained. It is shown how the use of coherent light may affect the relative merits of these types. The optical arrangements which have been suggested for each type are then reviewed, some modified designs are suggested, and experimental results are given. The design requirements for streak interferometry and for holography are also considered. A. B. K.

**A67-15456 #****LASER ENERGY MEASUREMENTS WITH A LIQUID ABSORPTION CELL.**

B. F. Scott (Birmingham, University, Dept. of Mechanical Engineering, Birmingham, England).

*Journal of Scientific Instruments*, vol. 43, Dec. 1966, p. 940-942. Research supported by the Ministry of Aviation.

The suggestion that the volume expansion of the liquid in an absorption cell calorimeter can provide an instantaneous record of the energy in a laser pulse is examined. Experiments with a cell of effective length 8 cm using a 5% solution of nickel sulfate are described. Because of the temperature-dependence of the cubical coefficient of expansion, sensitivity depends on the starting temperature, and the variation of displacement with energy is nonlinear. A pulse calibration technique is suggested and justified by comparative experiments with a nickel-copper cone calorimeter. (Author)

**A67-15461****LASER MICROPROBE HELPS IDENTIFY INCLUSIONS.**

Joseph R. Ryan and Jack L. Cunningham (Harbison-Walker Refractories Co., Garber Research Center, Pittsburgh, Pa.).

*Metal Progress*, vol. 90, Dec. 1966, p. 100-103.

Use of the laser microprobe, an instrument emitting a thin beam of high energy light which vaporizes minute volumes of material from small zones of samples whose surfaces are polished, fractured or rough, to study small inclusions in metals. Because the vapor can be analyzed by an emission spectrograph, amounts of each element found in inclusions of various metals can be determined. M. F.

**A67-15462 \*****HYPERFINE STRUCTURE AND PARAMAGNETIC PROPERTIES OF EXCITED STATES OF XENON STUDIED WITH A GAS LASER.**

H. R. Schlossberg and A. Javan (Massachusetts Institute of Technology, Dept. of Physics, Cambridge, Mass.).

*Physical Review Letters*, vol. 17, Dec. 19, 1966, p. 1242-1244. 5 refs.

Grant No. NSG-330; Contract No. AF 19(628)-4011.

Application of an effect which is of spectroscopic value in the determination of hyperfine structure and paramagnetic properties of highly excited atomic levels. The structure of a highly excited electronic state of  $^{129}\text{Xe}$  is determined, and measurements are reported of the g values of several excited states of Xe, together with estimates of their radiative lifetimes. The experiments involve the saturation behavior of a Doppler-broadened transition consisting of levels with closely spaced structural components. The transition is considered to interact with a radiation field consisting of several optical frequencies lying within the Doppler width. B. B.

**A67-15464****MIXING OF VISIBLE AND NEAR-RESONANCE INFRARED LIGHT IN GaP.**

W. L. Faust and Charles H. Henry (Bell Telephone Laboratories, Inc., Murray Hill, N. J.).

*Physical Review Letters*, vol. 17, Dec. 19, 1966, p. 1265-1268. 9 refs.

Discussion of the observation of sum and difference frequency generation when visible laser light is mixed in GaP with each of five IR laser frequencies near the lattice resonance (reststrahl). The measured IR frequency dependence of the nonlinear susceptibility, which varies by a factor of 60, is accounted for by theory. A Cassegrainian optical arrangement was used to bring a 6328-Å He-Ne laser beam and the IR beam to a common focus on the surface of a GaP crystal at room temperature. B. B.

**A67-15478****LASER MACHINING OF THIN FILMS.**

K. Board and W. G. Townsend (Wales, University, University College of Swansea, School of Engineering, Swansea, Wales).

*Microelectronics and Reliability*, vol. 5, Nov. 1966, p. 251-254. 5 refs.

Theoretical aspects of the vaporization of thin metallic films with a focused laser beam and experimental results prepared by using the pulsed high pressure helium-neon laser developed by Boot et al. The temperature at the center of a focused spot on a conducting slab is determined, and the rapidity with which thermal equilibrium is reached is compared with the duration of the available laser pulses. The variation of the final temperature reached is found to depend linearly upon the reciprocal spot size, over a certain range, and to vary linearly with laser power. The results obtained show the feasibility of using a laser for cutting thin conducting films. Some conflict with the conclusions of previous workers is noted, and an attempt is made to resolve the differences. (Author)

**A67-15497****VARIATION OF THE POPULATION INVERSION DURING LASER EMISSION OF A RUBY [VARIATION DE L'INVERSION DE POPULATION PENDANT L'EMISSION LASER DU RUBIS].**

Yves Druet (Lyon, Université, Laboratoire d'Electronique et de Physique du Solide, Lyons, France).

*Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques*, vol. 263, no. 20, Nov. 14, 1966, p. 1124-1126. In French.

Measurement of fluorescent intensity of a ruby laser to determine the variation in population inversion during laser emission. It is shown that the population inversion increases between the beginning and the end of the laser emission. It is concluded that the depopulation is localized in very small zones of maximum beam intensity. A. B. K.

**A67-15498****INFLUENCE OF THE CONFIGURATION UTILIZED ON THE THRESHOLD OF AN OPTICAL-PUMPING LASER [INFLUENCE DE LA CONFIGURATION UTILISEE SUR LE SEUIL D'UN LASER A POMPAGE OPTIQUE].**

Pierre Brun and Jeanine Bonamy (Rennes, Université, Laboratoire de Radioélectricité, Rennes, France).

*Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques*, vol. 263, no. 20, Nov. 14, 1966, p. 1127-1130. 5 refs. In French.

Comparison of the outputs of the two geometrical configurations most frequently used in the realization of optical-pumping lasers. A calculation is made of the fraction of luminous energy captured by a configuration consisting of helicoidal flash lamps and cylindrical reflectors and by a configuration consisting of linear flash lamps and elliptical reflectors. The maximum outputs for these two configurations are found to be 40 and 60%, respectively. A threshold energy of 1100 joules with a helicoidal lamp and of 374 joules with a linear lamp is obtained experimentally for the same ruby. A. B. K.

**A67-15620****SURFACE ASPECTS OF THE THERMAL DEGRADATION OF GaAs P-N JUNCTION LASERS AND TUNNEL DIODES.**

H. Kessler and N. N. Winogradoff (National Bureau of Standards, Electron Devices Section, Washington, D. C.).

*IEEE Transactions on Electron Devices*, vol. ED-13, Oct. 1966, p. 688-691. 19 refs.

Owing to the similarity of the junction widths and doping levels in epitaxially formed GaAs lasers and conventional tunnel diodes, the gradual degradation of the latter under use might be expected to be intensified in the case of lasers operating under high duty cycle or CW conditions. It was found that the current-voltage characteristics of both the lasers and tunnel diodes underwent considerable thermal degradation even when no bias was applied and that the degradation was limited to surface or "junction edge" effects. The degradation of the current-voltage characteristic was correlated with degradation in the light output under forward bias. It was concluded that degradation under forward bias was also a surface effect induced by heating rather than by deterioration of the junction in the bulk, as commonly believed. Methods of controlling the degradations are discussed.

(Author)

**A67-15624 #**

THE POLARIZATION OF LASER LIGHT SCATTERED BY GASES. N. J. Bridge and A. D. Buckingham (Oxford, University, Inorganic Chemistry Laboratory, Oxford, England). *Royal Society (London), Proceedings, Series A*, vol. 295, Dec. 6, 1966, p. 334-349. 22 refs.

Research supported by the Department of Scientific and Industrial Research.

Measurements of the polarization of light scattered from the beam of a helium-neon gas laser at low pressures. The intensity, polarization and parallelism of the beam permit high accuracy, and new values for the depolarization ratios of 24 simple species are reported. The general quantum theory of scattering is discussed and applied in detail to the evaluation of a formula for the depolarization ratio of the scattered light. It is found that quantum corrections to the classical formula arise from (1) the effects of frequency changes due to rotational Raman scattering, (2) changes in the molecular polarizability with rotational state due to centrifugal distortion, (3) approximations inherent in the polarizability scattering formula, and (4) vibrational Raman scattering. Effect (1) reduces the depolarization of hydrogen to 91% of its classical value; (3) is unimportant unless the frequency of the light is near an absorption frequency of the molecule. The depolarization measurements have been combined with refractivity data to yield the anisotropies in molecular polarizabilities of the molecules studied.

(Author)

**A67-15649**

DIRECT OBSERVATION OF ABRUPT TRANSMISSION CHANGE DURING RUBY-LASER EMISSION [DIREKTE BEOBACHTUNG DER SPRUNGHAFTE ÜBERBESETZUNGSÄNDERUNG WÄHREND DER LASEREMISSION BEIM RUBINLASER].

S. Laborge and H. Weber (Berlin, Technische Universität, I. Physikalisches Institut, Berlin, West Germany). *Zeitschrift für angewandte Physik*, vol. 21, no. 6, 1966, p. 453-456. 11 refs. In German.

Research supported by the Stiftung Volkswagenwerk.

Measurement of the change in ruby transmission resulting from pumping with a xenon flash lamp, for  $\lambda = 3650 \text{ Å}$ . The behavior of the excess population during pumping is determined with and without laser action. It proved possible to observe the abrupt change in excess population that accompanies the appearance of a spike, as predicted by the theory.

V. P.

**A67-15663 \***

A LASER GUIDANCE SYSTEM FOR RENDEZVOUS AND DOCKING. Thomas P. Dixon, H. Dean Coombes (International Telephone and Telegraph Corp., ITT Federal Laboratories Div., San Fernando, Calif.), and Charles L. Wyman (NASA, Marshall Space Flight Center, Huntsville, Ala.).

(Institute of Navigation, National Space Navigation Meeting, Boston, Mass., Apr. 21, 22, 1966, Paper.)

*Navigation*, vol. 13, Autumn 1966, p. 231-245.

Development of a laser guidance system for rendezvous and docking which will provide the necessary intelligence to the guidance computer to effect a complete rendezvous and docking operation automatically. The system uses uncooled gallium arsenide laser arrays operating in a pulsed mode for initial acquisition and subsequent measurement of X and Y angles, angle rates, range, and range rates. When the distance between the two spacecraft has been

reduced to less than 3 km, greatly increased range and range rate accuracy are obtained by the use of an incoherent gallium arsenide diode source continuously modulated at a high frequency, and using phase-locked detection techniques in the receiver. Control of the spacecraft from this sensor continues until the docking operation is completed.

M. F.

**A67-15665 \***

THE RING LASER INERTIAL SENSOR.

Earl J. McCartney (Sperry Rand Corp., Sperry Gyroscope Co., Electro-Optics Group, Great Neck, N.Y.).

(Institute of Navigation, National Space Navigation Meeting, Boston, Mass., Apr. 21, 22, 1966, Paper.)

*Navigation*, vol. 13, Autumn 1966, p. 260-269. 14 refs.

USAF-NASA-supported research.

Discussion of the ring laser as a novel type of inertial sensor. This device is a multiple-beam interferometer which - when rotated about an axis normal to its plane - converts optical phase shifts into optical frequency differences. There is no response to rotation about any other axis. Two highly coherent and oppositely traveling light waves are generated by laser action along the closed path, which itself forms the required laser resonant cavity. Basic to the ring laser is the constant velocity of light in a rotating frame of reference. Employing only optical, atomic, and electronic phenomena, the unique ring laser sensor achieves unusual angular resolution and mechanical simplicity. Applications of the rotation sensor for aerospace systems are examined.

M. F.

**A67-15759**

GALLIUM ARSENIDE LASER WITH PLANE RESONATOR.

N. G. Basov, O. V. Bogdankevich, V. A. Goncharov, B. M. Lavrushin, and V. Iu. Sudzilovskii (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(Akademiia Nauk SSSR, Doklady, vol. 168, June 21, 1966, p. 1283-1286.)

*Soviet Physics - Doklady*, vol. 11, Dec. 1966, p. 522-524. 9 refs.

Translation.

[For abstract see issue 21, page 3746, Accession no. A66-38955]

**A67-15760**

CHANGE IN OSCILLATION WAVELENGTH FOR A FOUR-LEVEL LASER.

B. I. Stepanov (Akademiia Nauk Belorusskoi SSR, Institut Fiziki, Minsk, Belorussian SSR).

(Akademiia Nauk SSSR, Doklady, vol. 168, June 21, 1966, p. 1294-1297.)

*Soviet Physics - Doklady*, vol. 11, Dec. 1966, p. 530-532. 5 refs.

Translation.

[For abstract see issue 21, page 3746, Accession no. A66-38956]

**A67-15776**

INTENSITY FLUCTUATIONS AND STATISTICS OF LASER RADIATION.

J. A. Fleck, Jr. (California, University, Lawrence Radiation Laboratory, Livermore, Calif.).

*Physical Review, 2nd Series*, vol. 152, Dec. 2, 1966, p. 278-286. 12 refs.

AEC-sponsored research.

The steady-state intensity distribution for a laser operating somewhat above threshold is determined by solving a master equation. The master equation describes the interaction between a single radiation mode and N two-level atoms, it contains the effects of pumping and radiation loss from the cavity, and it is applicable to both homogeneous and Doppler broadening. Forms of the master equation applicable to both three- and four-level lasers are considered. Solutions are obtained under the assumption that the distribution of atoms and radiation intensity is a bivariate Gaussian. Fluctuations in the output of giant-pulse lasers are also considered.

(Author)

**A67-15777****AMPLITUDE AND FREQUENCY CHARACTERISTICS OF A RING LASER.**

T. J. Hutchings, J. Winocur, R. H. Durrett, E. D. Jacobs, and W. L. Zingery (North American Aviation, Inc., Autonetics Div., Anaheim, Calif.).

*Physical Review, 2nd Series*, vol. 152, Dec. 2, 1966, p. 467-473. 14 refs.

The variations in intensity and difference frequency of the oppositely directed traveling waves in a ring laser with a single isotope and with mixed isotopes of neon have been measured as a function of cavity tuning. Agreement with the theory of Aronowitz and Heer is obtained. Amplitude modulations of each beam intensity at the difference frequency are observed. The sum intensity shows a power dip and no modulation. Complete extinction of one traveling wave over narrow frequency bands separated by one half of the mode spacing is observed. In two-mode operation the observed extinction width is less than 1 Mc.

(Author)

**A67-16130****FLUORESCENCE RATIO IN ANTHRACENE MELT AND SOLUTION WITH CIRCULAR AND LINEAR POLARIZATION OF RUBY-LASER EXCITATION.**

F. C. Strome, Jr. and J. S. Hayward (Eastman Kodak Co., Research Laboratories, Rochester, N.Y.).

*Journal of Chemical Physics*, vol. 45, Dec. 1, 1966, p. 4356, 4357.

Experimental investigation of the unresolved problem of the nature of the excited state resulting from the two-quantum absorption associated with the fluorescence produced in anthracene by ruby-laser light. The fluorescence emission is found to be unpolarized, and its intensity to be independent of the direction of linear polarization of the laser beam.

M.F.

**A67-16287****DECREMENT IN VISUAL ACUITY FROM LASER LESIONS IN THE FOVEA.**

Myron L. Wolbarsht (U.S. Navy, Bureau of Surgery and Medicine, Washington, D.C.).

*Aerospace Medicine*, vol. 37, Dec. 1966, p. 1250-1252. 11 refs.

Navy Contract No. RAE-13-X-047-5031-R004-01-001; DASA Contract No. MIPR-557-66.

The functional loss following destruction of selected areas in the fovea of stump-tail macaque monkeys has been investigated by psychophysical methods. The lesions were produced by radiation from ruby (6943 Å) and neodymium (10,600 Å) lasers in the non-Q-switched mode. The ruby laser caused destruction of the pigment epithelium and associated structures while the neodymium laser had its main effect in the neural layers of the retina. Total destruction of the fovea reduces visual acuity from 1.4 to 9'. The laser photo-coagulators and the psychophysical equipment are pictured and described. Possible future experiments are discussed.

(Author)

**A67-16350****SOME APPLICATIONS OF THE GENERALIZED CALLEN-WELTON THEOREM TO THE CALCULATION OF THE OSCILLATION CHARACTERISTICS OF QUANTUM DEVICES [O NEKOTORYKH PRIME-NENIAKH OBOBSHCENNOI TOREMY KALLENA-VELTONA DLIA RASCHETA FLUKTUATSIONNYKH KHKARAKTERISTIK KVANTOVYKH USTROISTV].**

V. B. Tsaregradskii (Gor'kovskii Gosudarstvennyi Universitet, Gorki, USSR).

*Radiofizika*, vol. 9, no. 6, 1966, p. 1134-1141. 11 refs. In Russian.

Application of the generalized Callen-Welton theorem to the calculation of maser oscillations in the amplification and generation regimes. The noise spectral energy is determined for a maser amplifier oscillator. The limiting spectral-line width is determined for molecular maser oscillations, and the results are compared with other results.

V. Z.

**A67-16361****PARAMETRIC AMPLIFIERS AND GENERATORS OF LIGHT.**

S. A. Akhmanov and R. V. Khokhlov (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR).

*(Uspekhi Fizicheskikh Nauk, vol. 88, Mar. 1966, p. 439-460.)*

*Soviet Physics - Uspekhi*, vol. 9, Sept.-Oct. 1966, p. 210-222. 48 refs. Translation.

[For abstract see issue 14, page 2310, Accession no. A66-28358]

**A67-16379 \*****OBSERVATION OF DEGENERATE STIMULATED FOUR-PHOTON INTERACTION AND FOUR-WAVE PARAMETRIC AMPLIFICATION.**

R. L. Carman (Harvard University, Jefferson Physical Laboratory, Cambridge; Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.), R. Y. Chiao (Massachusetts Institute of Technology, Dept. of Physics, Cambridge, Mass.), and P. L. Kelley (Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.).

*Physical Review Letters*, vol. 17, Dec. 26, 1966, p. 1281-1283. 11 refs. USAF-supported research; Grant No. NaG-330.

Observation of stimulated four-photon or light-by-light scattering for the case where the coupling is due to the molecular-orientation Kerr effect. When the Raman effect was photographed, no Raman light in the forward direction could be observed for the 3-mm cell, but it was strongly present for the 7.5-cm cell. For the longer cells, if the +0 beam was varied from zero to 7% of the forward laser power, the Raman power changed by two orders of magnitude. However, when the forward laser power was increased by the same amount, no such marked increase in the Raman effect was observed.

M.F.

**A67-16390****CONCERNING THE THEORY OF OPTICALLY COUPLED GaAs P-N JUNCTION LASERS.**

Iu. P. Zakharov, V. V. Nikitin, A. S. Semenov, A. V. Uspenskii, and V. A. Shcheglov (Akademii Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*(Fizika Tverdogo Tela, vol. 8, July 1966, p. 2087-2091.)*

*Soviet Physics - Solid State*, vol. 8, Jan. 1967, p. 1660-1663. 6 refs. Translation.

[For abstract see issue 21, page 3746, Accession no. A66-38920]

**A67-16517 \* #****UNCONVENTIONAL INERTIAL SENSORS.**

Robert C. Langford (NASA, Electronics Research Center, Cambridge, Mass.).

*Astronautica Acta*, vol. 12, July-Aug. 1966, p. 294-314. 110 refs.

The paper surveys methods of operation, present state of development, and performance of inertial sensors not using principles of angular (or vibrational) momentum of rigid bodies. Fluid-sphere technology, using a rotating body of fluid, has made possible a gyroscope with two degrees of freedom. Ring lasers, with their lack of moving parts, have achieved drift rates of a few tenths of a degree per hour. In electrostatic gyroscopes, where high-voltage breakdown sets a limit to levitation forces, present design projections offer promise of 100-g operation for small balls. Magnetic-resonance gyroscopes and superconductive gyroscopes are discussed, and an introduction is given to newer concepts using relativistic sensors, rotating tensor sensors, vortex rate sensors, and quantum mechanical effects.

(Author)

**A67-16547****APPLICATION OF NUCLEAR RADIATION TO THE PUMPING OF LASERS.**



## A67-16586

V. E. Derr, G. T. McNice, and P. M. Rushworth (Martin Marietta Corp., Martin Co., Orlando, Fla.).

IN: RADIOISOTOPES FOR AEROSPACE; PROCEEDINGS OF THE FIRST SYMPOSIUM ON RADIOISOTOPE APPLICATIONS IN AEROSPACE, DAYTON, OHIO, FEBRUARY 15-17, 1966. PART 2 - SYSTEMS AND APPLICATIONS. [A67-16526 05-22]

Symposium sponsored by the U.S. Air Force, the U.S. Atomic Energy Commission, and the Instrument Society of America. Edited by J. C. Dempsey and Paul Polishuk.

New York, Plenum Press, Division of Plenum Publishing Corp., 1966, p. 309-346. 32 refs.

Contract No. AF 33(615)-2022.

Discussion of the possible uses of nuclear radiation, either from fission or from radioisotopes, in providing the primary power for pumping lasers. The employment of all forms of nuclear radiation including  $\alpha$ ,  $\beta$ ,  $\gamma$ , and  $n$  radiation is considered from the point of view of efficiency and availability. The characteristics of sources necessary to supply this radiation are discussed. The amount of power necessary for the threshold of oscillation is calculated for several types of gaseous and solid lasers and compared with the amount of nuclear pumping power available. Spectroscopic studies to establish the parameters of solid-state materials favorable to nuclear pumping are described, and the mechanism of energy transfer which produces optical fluorescence from the absorption of high-energy radiation is considered. The laser cutoff phenomenon is described, and potential cures are discussed.

F. R. L.

## A67-16586

HELIUM-NEON LASER - THERMAL HIGH-RESOLUTION RECORDING.

C. O. Carlson, E. Stone, H. L. Bernstein, W. K. Tomita, and W. C. Myers (National Cash Register Co., Hawthorne, Calif.).

Science, vol. 154, Dec. 23, 1966, p. 1550, 1551.

Scan-line recording by means of a moving laser spot has been achieved on metallic and organic thin films. Recording rates of the order of one million spots per second were obtained with a laser beam power of 38 mw at the recording surface. Typical recorded line widths were of the order of 2  $\mu$ .

(Author)

## A67-16598

ELECTRON DENSITY AND COLLISION FREQUENCY OF A HELIUM-NEON LASER PLASMA [DENSITE ET FREQUENCE DE COLLISION DES ELECTRONS DU PLASMA D'UN LASER A HELIUM-NEON]. Jean-François Delpech and Christian Vauze (Paris, Université, Institut d'Electronique Fondamentale, Orsay, Seine-et-Oise, France).

Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques, vol. 263, no. 22, Nov. 28, 1966, p. 1238-1241. 9 refs. In French.

Calculation of the electron-collision frequency of a helium-neon laser plasma on the basis of previously obtained experimental data. The calculated values of the frequency are then compared with experimentally measured values. The results of electron-density measurements, carried out according to a previously described method, are cited.

A. B. K.

## A67-16623 \*

EXCESS PHOTON NOISE IN MULTIMODE LASERS.

H. Hodara (Tetra Tech, Inc., Pasadena, Calif.) and N. George (California Institute of Technology, Pasadena, Calif.).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 337-340. 13 refs.

Contracts No. NAS 1-6003; No. AF 49(638)-1322.

A theory is developed for the excess photon noise in the detected photocurrent of the multimode laser. Two simple cases are treated: in one, the modes are uncoupled and in the other, they are phase-locked. Both cases can be realized when a gas laser is operated under saturation conditions well above threshold, where

complicated mode interactions make a detailed analysis difficult. As predicted, the excess photon noise is zero db, within experimental error, for the phase-locked case; and it is approximately  $20 \pm 3$  db for a stable vibration isolated laser operating in a multimode, nonlocked condition. Precautions have been taken to eliminate extraneous noise due to power supply ripple and the like, and the highly nonideal contribution of the photomultiplier has been subtracted out.

(Author)

## A67-16624

PHOTOCOUNT DISTRIBUTIONS AND FIELD STATISTICS.

F. T. Arecchi (Centro Informazioni Studi Esperienze, Milano, Università, Istituto di Fisica, Milan, Italy), A. Berné, A. Sona (Centro Informazioni Studi Esperienze, Milan, Italy), and P. Burlamacchi (Consiglio Nazionale delle Ricerche, Centro Microonde, Florence, Italy).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 341-350. 26 refs.

Research supported by the Consiglio Nazionale delle Ricerche.

The statistical properties of a radiation field (either Gaussian or laser) have been investigated by photon counting distributions. Two methods (nonlinear and linear) are introduced and compared from the viewpoint of the accuracy of the measurement and of the associated information capacity. The method of the "joint photocount distributions" is introduced as a new tool for the investigation of the time evolution of a random field.

(Author)

## A67-16625

THE MEASUREMENT OF THE FREQUENCY FLUCTUATIONS OF A LASER FIELD.

Benedetto Daino (Stanford University, Stanford, Calif.).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 351-354. 6 refs.

Contract No. DA-043-AMC-00446(E).

Proposal of a method which makes possible the photoelectric measurement of the cross-correlation function of the frequency (or phase) fluctuations of a laser field. The optical signal from a single laser at two points  $P_1$  and  $P_2$  is mixed separately with two other independent lasers in two photodevices. After detection of the beats, the two signals are passed each through a limiter and a frequency discriminator tuned to the center frequency of the beats. The output signals are then proportional to the fluctuating instantaneous frequency differences between the incoming beam and each of the local oscillator lasers. These two signals are then correlated with an electronic correlator. The details of the calculations are presented. It is shown that the SNR attainable in such a measurement can be quite satisfactory.

M. F.

## A67-16627

TWO-QUANTUM PHOTOIONIZATION OF Cs AND I<sup>+</sup>.

J. L. Hall (National Bureau of Standards, and Colorado, University, Joint Institute for Laboratory Astrophysics, Boulder, Colo.).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 361-363. 8 refs.

ARPA-supported research.

Review of a recent experiment which measured the photodetachment probability for I<sup>+</sup> ions due to simultaneous absorption of two ruby quanta. We have calculated the two-quantum photoionization rate for atomic cesium as a function of wavelength. The "transition" from the initial state to the bound intermediate state is expressed in terms of oscillator strengths. The second "transition," from

these excited valence states into the coulomb continuum, is expressed as a cross section. What appear to be genuine two-photon ionization signals have been observed in three cases: (1) near resonance in the  $10P_{3/2}$  state using the second-harmonic of Q-switched ruby, (2) away from resonances, using the 5300-Å second-harmonic of Q-switched neodymium laser, and (3) away from resonances using the first anti-Stokes line at 5750 Å from ruby-pumped D<sub>2</sub> gas. Present experiments aim at scanning the interesting range near resonance, e.g., by thermally tuning the ruby. (Author)

#### A67-16628

##### THE UTILIZATION OF SEMICLASSICAL AND RATE EQUATIONS FOR DESIGN OF STEADY-STATE LASERS.

A. L. Mikaelian, M. L. Ter-Mikaelian, J. G. Turkov, and V. V. Diachenko (Ministry of Radio Industry, Moscow, USSR). (Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)  
IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 363-365. 6 refs.

Semiclassical equations are used to determine the output power of steady-state optical maser as a function of various parameters (pumping level, crystal losses, cavity length, and mirror transparency). The results obtained are compared with those given by the rate equations theory (as applied to a ruby crystal). It is shown that the difference between these two methods from the technical point of view is insignificant and did not appear in ordinary experiments. (Author)

#### A67-16629

##### RECENT DEVELOPMENTS IN CO<sub>2</sub> LASERS.

J. D. Rigden and G. Moeller (Perkin-Elmer Corp., Norwalk, Conn.). (Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)  
IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 365-368.

Experimental results showing the effect of tube diameter on the output power and efficiency of CO<sub>2</sub> lasers. It is shown that both output power and efficiency are almost independent of diameter over the range from 11 to 44 mm. The measured values of the output power and efficiency are 75 watts per meter and 10%. Higher efficiencies are obtained at lower power outputs. Mirror damage is discussed, and two experiments involving the irradiation of CO<sub>2</sub> and ammonia with a high power laser beam are mentioned. An explanation is given for the strong interaction between the laser beam and the discharge tube current. The flow calorimeter used to measure high power laser beams is described. (Author)

#### A67-16630

##### PULSED AND STEADY-STATE INFRARED EMISSION STUDIES OF CO<sub>2</sub> LASER SYSTEMS.

M. J. Weber and T. F. Deutsch (Raytheon Co., Research Div., Waltham, Mass.). (Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)  
IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 369-375. 24 refs.  
Contract No. DA-01-021-AMC-12427(Z).

Transient and steady-state IR emissions at 2.5 to 15  $\mu$  from low-lying vibrational-rotational levels of CO<sub>2</sub> have been studied using a dc discharge. The time-dependent behaviors of several levels important for laser excitation and relaxation were examined following a pulsed discharge. The decays were, in general, different and were not simple exponentials. Relaxation of vibrational energy of CO<sub>2</sub> appears to occur by collisions involving vibration-vibration exchange between different vibrational modes and vibration-translation relaxation of the bending mode. The rate of transfer of vibrational excitation from N<sub>2</sub> to various vibrational modes

of CO<sub>2</sub> was investigated as a function of CO<sub>2</sub> pressure. The addition of He reduced the emission from the lower laser levels with respect to that from the upper laser level and increased the nonradiative decay rate of the lower vibrational levels by CO<sub>2</sub>-He collisions. Under pulsed excitation, in addition to CO<sub>2</sub> laser action nearly coincident with the pulse, a weaker, delayed output was observed.

(Author)

#### A67-16631

##### RATE DETERMINING PROCESSES FOR THE PRODUCTION OF RADIATION IN HIGH POWER MOLECULAR LASERS.

W. J. Witteman (Philips' Gloeilampenfabrieken, Philips Research Laboratories, Eindhoven, Netherlands). (Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)  
IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 375-378. 9 refs.

The excitation mechanisms and relaxation processes will be described for a closed molecular gas laser 240 cm long and 2.3 cm in diam filled with 1 torr carbon dioxide, 2.5 torr nitrogen, and 7.2 torr helium; the influence of adding 0.2 torr water vapor is discussed. When all the four components are present, an output of 103 watts is reached with an efficiency of 12.5%. It can be argued that in the absence of water vapor the deactivation of the lower laser level is rate determining for the radiation production. However, the addition of water vapor (0.2 torr) contributes greatly to depopulating the lower laser level by thermal relaxation, and it makes the output increase by more than a factor of two. In the latter case the vibrational excitation of the nitrogen molecules by electron impact is rate determining. Small amounts of impurities with partial pressures, sometimes less than  $10^{-6}$  torr, have been observed to cause a considerable decrease of radiation output. This "poisoning" effect, caused by very small impurity concentrations, can be avoided by using a discharge tube made from fused silica (quartz). (Author)

#### A67-16632 \*

##### PROGRESS AND APPLICATIONS OF Q-SWITCHING TECHNIQUES USING MOLECULAR GAS LASERS.

G. W. Flynn, L. O. Hocker, A. Javan, M. A. Kovacs, and C. K. Rhodes (Massachusetts Institute of Technology, Dept. of Physics, Cambridge, Mass.). (Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)  
IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 378-381.

USAF-NASA-supported research.

The characteristics of a Q-switched CO<sub>2</sub>-N<sub>2</sub>-He molecular laser are considered. In particular, it has been found that a 3-watt continuous system gives a Q-switch output power in excess of 10 kw per pulse. A method for determining rotational collision cross sections for CO<sub>2</sub> is discussed, and an induced fluorescence technique is described which is capable of giving cross sections for vibrational relaxation in CO<sub>2</sub>. The importance of various collisional coupling mechanisms and relaxation rates in determining total CW and Q-switch output power is also considered. (Author)

#### A67-16633

##### HIGH RESOLUTION SPECTROSCOPY BY ZEEMAN-TUNED INFRARED LASER.

Henri Brunet (Compagnie Générale d'Electricité de Paris, Centre de Recherches, Département Recherches Physiques de Base, Marcoussis, Seine-et-Oise, France). (Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)  
IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 382-384. 6 refs.

A Zeeman-tuned laser oscillating at nearly all laser transitions between 3 and 9  $\mu$  has been designed, and absorption bands between 1250 and 1450 cm<sup>-1</sup> where many xenon and neon laser lines have

## A67-16634

sufficient gain to allow displacements of  $0.1 \text{ cm}^{-1}$  have been studied. The apparatus is an internal-mirror discharge, dc excited, on a granite bench well isolated from mechanical vibrations. The Fabry Perot cavity is 1.66 m. Applied axial magnetic fields vary from 0 to 1800 gauss. The circular polarizations are converted to linear perpendicular polarizations by a quarterwave plate consisting of a Fresnel prism. The laser beam, after passage through the absorption cell, is detected by a Ge-Au cell behind a monochromator. The detected signal and the magnetic field are simultaneously recorded by an XY recorder. (Author)

## A67-16634

### GENERATION OF NEW INFRARED MASER FREQUENCIES BY ISOTOPIC SUBSTITUTION.

G. B. McCurdy and I. Wieder (Carver Corp., Mountain View, Calif.).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 385-387. 18 refs.

Research supported by the Interphase Corporation-West, the Mobil Oil Co., and USAF.

The effect of isotopic substitution on the natural frequencies of vibrational-rotational transitions in diatomic and triatomic molecules is discussed to show how new IR maser frequencies can be obtained which differ significantly from the original. The magnitude of this effect, in which the ratio of the original frequency to the isotopically shifted frequency may be as great as 1.4 in one case considered, is to be contrasted with the corresponding isotope effect on the frequency of electronic transitions in atoms, where the shift in frequency thus obtained is extremely small, typically amounting to one part in  $10^4$ . The calculated effect of the isotope shift on the frequencies of two known diatomic molecular infrared masers is given for selected isotopes. The results of an experiment in which  $\text{O}^{18}$  was substituted for  $\text{O}^{16}$  in the  $\text{CO}_2$  infrared maser are given as an interesting example of the isotope effect on a triatomic molecule. It is found that the dominant  $10.6\text{-}\mu$  maser transition in  $\text{C}^{12}\text{O}_2^{16}$  is shifted to  $9.4\text{-}\mu$ , while the  $9.5\text{-}\mu$  transition is shifted to  $10.4\text{-}\mu$  as a result of double substitution of  $\text{O}^{18}$  for  $\text{O}^{16}$  in the  $\text{CO}_2$  molecule. Several advantages for spectroscopy and infrared technology are mentioned as resulting from the availability of new coherent infrared sources. (Author)

## A67-16635

### RELAXATION IN THE LEVEL $F = 1$ OF THE GROUND STATE OF HYDROGEN - APPLICATION TO THE HYDROGEN MASER.

J. Vanier and R. F. C. Vessot (Varian Associates, Beverly, Mass.).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 391-398. 15 refs.

Contracts No. NAS 8-2604; No. Nonr-3570(00).

A theory of relaxation by the random excitation of transitions in the level  $F = 1$  of the ground state of hydrogen is described. The theory is applied to the case of the hydrogen maser. It is found that this type of relaxation, when introduced in the maser in a controlled manner, makes possible the measurement of parameters fundamental to the design of the maser. Experiments are described in which a magnetic gradient producing transitions between the  $F = 1$  states is created by a current passing through a straight conductor in the storage bulb. Experimental results for various modes of operation of the maser are given. (Author)

## A67-16636

### MODULATION EFFECTS IN AN AMMONIA BEAM MASER OSCILLATOR.

D. C. Lainé and A. L. S. Smith (Keele, University, Dept. of Physics, Keele, Staffs., England).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 399-408. 24 refs.

Modulation of the amplitude of oscillation of an ammonia beam maser is discussed for those cases where the molecular beam passes through a single cavity and two cavities in succession. It is shown that experiments using a single cavity in which the molecular beam flux is modulated by variations of the EHT applied to the state separator can yield information about the velocities of the molecules which contribute to the oscillation power. In the cascaded cavity case complex behavior is observed when either the molecular flux or the matching to the first cavity is modulated. These effects are interpreted in terms of the static characteristics of the cascaded cavity system. A self-modulation phenomenon and unusual variations of the oscillation amplitude are also reported for the cascaded cavity system which is obtained for a beam flux just above the oscillation threshold. These results and their interpretation in terms of the resolved hyperfine structure of  $\text{N}^{14}\text{H}_3$  are discussed. (Author)

## A67-16638

### LASER-PUMPED MICROWAVE EMISSION IN EXCITED STATES OF NEON.

T. F. Johnston, Jr., R. L. Abrams, and G. J. Wolga (Cornell University, Ithaca, N.Y.).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 412-417. 14 refs.

ARPA-supported research.

A new technique for producing a controlled excited state population for purposes of radio-frequency excited state spectroscopy is illustrated in the experiment reported here. This consists of using the coherent optical field of a gas laser as a pump for a microwave transition between excited states internal to the laser system. From the peak transition frequency observed, we obtain a value, more accurate than previously known, for the energy separation of the  $3p_2$  and  $3p_4$  fine structure levels of neon of  $26,359 \pm 1 \text{ MHz}$ . Since observations are made at microwave frequencies, narrow resonances are directly observed whose widths are determined primarily by collision broadening or natural decay to lower lying levels. Hence, by means of this technique, it is possible to study the dependence of these broadening mechanisms on a variety of experimental conditions. (Author)

## A67-16640

### THE SECOND HARMONIC GENERATION OF LIGHT BY FOCUSED LASER BEAMS.

D. A. Kleinman, A. Ashkin, and G. D. Boyd (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 425-429. 5 refs.

Experimental and theoretical study on second-harmonic generation (SHG) by focused laser beams in nonlinear crystals which are large compared to the extent of the focus. The gas laser beam is in the lowest order (Gaussian) mode and very close to index-matching conditions in the crystal. The intensity pattern of the SHG observed photographically has roughly the shape of a half moon with a very sharp edge. Fine structure has been observed consisting of a series of fringes extending from the edge into the bright region. The power has also been measured as a function of crystal orientation, and the position of the edge has been determined for the orientation giving maximum power. The theoretical treatment of the problem is based upon an exact formula for the second-harmonic field for the case in which the laser beam is in a Gaussian mode. A detailed

analysis of the experimental data is presented which shows the theory to be in quantitative as well as qualitative agreement with experiment. (Author)

#### A67-16641

##### SHORT-PULSE Q-SWITCHED LASER WITH VARIABLE PULSE LENGTH.

R. V. Ambartsumian, N. G. Basov, V. S. Zuev, P. G. Kriukov, and V. S. Letokhov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 436-441. 26 refs.

A powerful light pulse propagation through an optical amplifier driven at saturation was studied theoretically and experimentally. It was shown that the maximum light pulse of a Q-switched laser propagates through amplifying medium with velocity much higher than the light velocity without any essential decrease of pulse duration. Conditions of reducing pulse duration by nonlinear amplification were found. It was found necessary to increase the leading edge rise time of the light pulse. "Superlight" velocity of propagation was measured in experiments. Appreciable reduction of pulse duration by nonlinear amplification was achieved experimentally when the leading edge of the input light pulse had been cut down by an additional Kerr cell. (Author)

#### A67-16642

##### A LASER WITH A NONRESONANT FEEDBACK.

R. V. Ambartsumian, N. G. Basov, P. G. Kriukov, and V. S. Letokhov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 442-446. 8 refs.

Investigation of a ruby laser with a nonresonant feedback. The nonresonant feedback is achieved by scattering of radiation. It is found that for the duration of a pulse, the emission line narrowed from 12 to 0.005  $\text{cm}^{-1}$ . It is shown that such a laser can be used as an optical frequency standard. M. F.

#### A67-16643

##### THE THEORY OF DOPPLER AND IMPACT BROADENING OF SPECTRAL LINES AND PRESSURE EFFECTS ON THE POWER OUTPUT OF A GAS LASER.

S. Rautian and I. Sobel'man (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 446-448.

The theory of broadening and shift of the spectral lines including the statistical dependence of Doppler and impact broadenings is developed. One of the results of this theory is the possibility of obtaining asymmetric line profiles. With the aid of this theory, one can explain the experimental results of Szoke and Javan concerning the pressure effects on the dip in the power output of the gas laser. (Author)

#### A67-16644

##### MAGNETIC DEPOLARIZATION OF A VAPOR AND POLARIZATION OF A ZEEMAN LASER.

G. Durand (Harvard University, Div. of Engineering and Applied Physics, Gordon McKay Laboratory, Cambridge, Mass.).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 448-455. 16 refs.

Direction de Recherches et Moyens d'Essais Contract No. 69/70.

Lamb's self-consistent theory and rate equation approximation are used to determine the polarization of a monomode gas laser subjected to a magnetic field. The excited vapor is represented by a four level system; its motion is described in a Bloch analog form, using Fano formalism. In the stimulated emission (absorption) process, atoms and light are shown to exchange energy and angular momentum. This optically induced angular state of the vapor can be destroyed by the applied magnetic field, lowering the optical saturation. When the Zeeman sublevels no longer overlap, the laser tends to oscillate with a transverse polarization of minimized saturation. Experimental evidence of these changes of polarization is given with an internal plane mirror laser on the  $1.52 \mu$  ( $J = 1 - J = 0$ ) line of Ne 20. The observed data are pressure sensitive and give some information on the lifetime and disorienting cross section of the  $2s_2$  level of Ne. (Author)

#### A67-16645

##### DOUBLE RESONANCE GAS LASER SPECTROSCOPY IN NEON.

T. O. Carroll and G. J. Wolga (Cornell University, Ithaca, N. Y.).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 456-460. 15 refs.

ARPA-supported research.

A stimulated emission version of the Dodd and Series double-resonance experiment has been performed in neon on the  $1.15\text{-}\mu$  and  $1.52\text{-}\mu$  lasing transitions using an He-Ne gas laser placed in a transverse magnetic field. Auxiliary coils wound on the laser tube provide an rf magnetic field orthogonal to the transverse field. Changes in the laser intensity at values of the transverse field which are rational fractions of the field for which the Larmor frequency equals the rf frequency are observed in accordance with theory. The measured line width of resonance is  $45 \pm 10$  MHz for the  $1.15\text{-}\mu$  transition and  $40 \pm 10$  MHz for the  $1.52\text{-}\mu$  transition, indicating that the natural width of excited states is observed. We have obtained the g-factor for the  $2s_2$  level in neon;  $g = 1.23 \pm .05$ . As the laser cavity length is adjusted to provide axial mode separations in the neighborhood of the rf frequency, varying numbers of resonances are seen. These effects are discussed on the basis of a threshold theory in which transition probabilities are calculated with coherent matrix elements. (Author)

#### A67-16646

##### INTRA-CAVITY PERTURBATION OF A GAS LASER BY FARADAY EFFECTS IN GLASSES.

D. Chen and T. C. Lee (Honeywell, Inc., Research Center, Hopkins, Minn.).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 461-463. 6 refs.

The output intensity of a laser can be internally modulated by time-varying perturbation of the losses in the laser cavity. This technique greatly improves the efficiency of modulation over the external modulation methods and is therefore important for various proposed applications of lasers. We have studied the intracavity loss perturbation in an He-Ne laser utilizing the diamagnetic Faraday effect in glasses. In comparison with electrooptic crystals, glasses introduce a much smaller amount of static optical loss to the cavity, resulting in a higher output from the laser. Experimental observations of the modulated laser output confirm the predictions of our theoretical analysis. Furthermore, this modulation technique enables us to measure Faraday rotation of the modulator material as small as 0.01 sec of arc, which represents an enhancement of the measurement sensitivity by two orders of magnitude over the conventional technique. (Author)

**A67-16647****AN INTERNALLY SCANNED LASER.**

E. S. Kohn and V. J. Fowler (General Telephone and Electronics Laboratories, Inc., Bayside, N.Y.).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 464-466. 8 refs.

Method for producing a scanned beam of light from a laser which appears to be applicable to a high-deflection-rate scanner. Scanning is accomplished through the use of a pulsed optical delay line located within a special, enlarged laser cavity. Narrow shear pulses, traveling through the delay line, convert some of the incident plane polarized laser light to the orthogonal polarization by means of the photoelastic effect. The converted light is diffracted and is removed from the cavity by spatial filtering at a cavity focus. The light removed in this manner is imaged onto a screen. Since the delay line is inside the cavity, light passing around the shear pulse is recirculated and not wasted. Since quartz has a shear wave propagation velocity of 3840 m/sec, a delay line resonant at 30 Mc can propagate pulses about 0.13 mm wide. A beam 100 mm in diam would have 770 spot locations. The system has been operated with a delay line resonant at 10 Mc in a 1.5-cm collimated laser beam. A resolution of 15 spot positions was obtained with a beam power of 4 mwatt. For TV projection applications, scanning in the orthogonal direction and modulation would be accomplished with external devices. (Author)

**A67-16648 \*****A NEW CLASS OF TRAPPED LIGHT FILAMENTS.**

R. Y. Chiao, M. A. Johnson, S. Krinsky, H. A. Smith, C. H. Townes (Massachusetts Institute of Technology, Cambridge, Mass.), and E. Garmire (NASA, Electronics Research Center, Cambridge, Mass.).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 467-469. 11 refs.

Grant No. NSG-330; Contract No. AF 19(628)-4011.

A new class of self-trapped light filaments has been discovered and its properties investigated. These filaments have a very small diameter, ( $\sim 5 \mu$ ), contain a few ergs of energy, and last a very short time, ( $\leq 1$  nsec). Stimulated Raman emission occurs in these small filaments with high initial gain at the beginning of the filament and apparent saturation toward its end. Possible mechanisms for the creation, containment, and termination of these filaments are discussed. (Author)

**A67-16649 \*****POSSIBILITY OF SELF-FOCUSING DUE TO INTENSITY DEPENDENT ANOMALOUS DISPERSION.**

A. Javan (Massachusetts Institute of Technology, Dept. of Physics, Cambridge, Mass.) and P. L. Kelley (Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 470-473.

USAF-NASA-supported research.

Analysis of the influence of intensity dependent anomalous dispersion on the propagation of electromagnetic radiation. Particular attention is given to the propagation of laser radiation in a saturated amplifying medium. The self-focusing process due to intensity dependent anomalous dispersion is briefly described and the self-trapping condition and expected beam size are given. The intensity dependent index and gain for homogeneously and inhomogeneously broadened lines are discussed. Computer calculations of beam propagation are given for both types of broadening. M. F.

**A67-16650****EFFICIENT PULSED GAS DISCHARGE LASERS.**

W. T. Walter, N. Solimene, M. Piltch, and G. Gould (TRG, Inc., Melville, N.Y.).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 474-479. 19 refs.

Contract No. AF 49(638)-1535.

A class of lasers which operates by cyclic excitation and relaxation in atomic vapor discharges is discussed. The required energy level structure for maximum efficiency is described. Pulsed laser action in neutral atomic copper vapor at 5105.54 Å (58 db/m, 2 kw peak power) and at 5782.13 Å (42 db/m, 0.6 kw peak power) provides experimental verification and promises high efficiency. Pulsed laser action was also observed in ionized calcium at 8542.09 Å and 8662.14 Å. Both have saturated gains of 58 db/m and a total peak power output above 30 watts. (Author)

**A67-16651****ION EMISSION FROM LASER IRRADIATED TUNGSTEN.**

E. Bernal G., J. F. Ready (Honeywell, Inc., Research Center, Hopkins, Minn.), and L. P. Levine (Wisconsin, University, Milwaukee, Wis.).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 480-482. 12 refs.

Army-supported research.

The masses, energies, and numbers of ions emitted by a tungsten surface upon irradiation with a laser beam have been studied using a time-of-flight spectrometer. For light fluxes of 20 to 70 Mw/cm<sup>2</sup> the ion emission consists primarily of adsorbed species. Ion energies up to 180 ev have been measured. It is shown that inverse bremsstrahlung cannot account for the high energies observed. (Author)

**A67-16652****EVAPORATION AND HEATING OF A SUBSTANCE DUE TO LASER RADIATION.**

Iu. V. Afanas'ev, O. N. Krokhin, and G. V. Sklizkov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 483-486. 12 refs.

Gas-dynamic equations are studied for determination of heating, vaporization, and expansion of substance when a radiation of Q-switched laser is collimated onto a surface of solids. A possibility of existence of the self-regulating regime of vaporization and heating in one-dimensional case is proved for the case when an optical density value of the vaporized gas is about unity in all the stages of this process. The values for temperature and velocity of the substance expansion are obtained. An approximate consideration of this problem is carried out when a spherical case of expansion takes place describing substance vaporization by a strong-focused radiation. The experimental investigation data of gas-dynamic values are presented for the case of "plume" arising from collimated laser radiation interactions with the energy of several hundred Mev. Results obtained in experiments permit to calculate temperature, expansion velocity, and optical transparency of vaporized substance for different stages of this process. (Author)

**A67-16654****DENSITY AND TEMPERATURE OF A LASER INDUCED PLASMA.**

C. David, P. V. Avizonis, H. Weichel, C. Bruce (USAF, Systems Command, Research and Technology Div., Weapons Laboratory, Kirtland AFB, N. Mex.), and K. D. Pyatt (General Dynamics Corp., General Atomic Div., San Diego, Calif.).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 493-499. 15 refs.

The plasma "blow-off vapor", produced when a high power laser beam strikes a solid surface, has been studied experimentally and theoretically. Electron densities and plasma optical thicknesses have been measured both in time and position resolved manners for plasmas produced from carbon. The ruby laser system consisted of a "Q-switched" oscillator and one amplifier, both 7 in. long and 0.6 in. in diameter. The system energy output was between 8 and 13 joules in a 0.055- $\mu$ sec pulse width at half height. The electron density was measured using a gas laser as a probe light source and a Mach-Zehnder interferometer to measure the phase shifts due to plasma refractivity. The experiments were performed with incident laser energies of 10 to 1000 joules/cm<sup>2</sup> (by focusing). Electron densities as high as  $10^{19}$  cm<sup>-3</sup> were observed, with correspondingly high plasma optical thicknesses. There were strong indications of heating by the incident laser beam of the front edge of the plasma, which was not expected on the basis of plasma heating by free-free and bound-free absorption due to the low electron density existing there. In general, a theoretical treatment of plasma heating by the bound-free and free-free absorption agreed well with experiments. (Author)

#### A67-16655

##### RUBY LASER LOSS MEASUREMENT BY COMPARISON OF $R_1$ , $R_2$ THRESHOLDS.

D. C. Hanna, W. A. Gambling, and R. C. Smith (Southampton, University, Dept. of Electronics, Southampton, England). (Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)  
IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 507-510. 17 refs.

A simple method of measuring the losses of a ruby laser resonant cavity has been developed in which the thresholds for  $R_1$  line and  $R_2$  line operation are compared. A quartz birefringent filter is placed in the cavity with quartz disk cut to allow Brewster-angle operation and of such a thickness that the separation between pass bands of the filter analyzer combination is 28 Å. The analyzer, placed between the filter and the output mirror, consists of a stack of fused quartz plates at the Brewster-angle. A known loss is introduced into the cavity by means of a plate inclined to the laser beam at a known angle. With the filter set for  $R_2$  operation the threshold is adjusted to a suitable value by rotating the loss plate to give an attenuation  $L_2$ /pass. The filter is then reset for  $R_1$  operation and a different (larger) attenuation  $L_1$  must be introduced by the loss plate to raise the  $R_1$  threshold to the same level. An analysis of the threshold populations of the  $^2E$  levels shows that the losses of the cavity due to all sources of loss other than the loss plate may be obtained from a plot of  $\log L_1$  against  $\log L_2$ . (Author)

#### A67-16656

##### LASER BRIGHTNESS GAIN AND MODE CONTROL BY COMPENSATION FOR THERMAL DISTORTION.

C. Martin Stickley (USAF, Office of Aerospace Research, Cambridge Research Laboratories, Bedford, Mass.). (Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)  
IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 511-518. 24 refs.

In the limit of excellent optical quality of laser rods, the beam divergence will be determined by the optical distortion produced in the rod brought about by nonuniform absorption of pump light. For ruby lasers this has been shown to be approximately spherical and reproducible from firing-to-firing. Thus it should be possible to compensate for this by means of an external mirror having a curvature opposite to that induced in the rod, and by this technique reduce the beam divergence. The distortion produced in the rod is described in terms of a ray matrix of a thick lens whose focal length is a function of the input energy to the rod. A procedure is given for measuring this focal length to within  $\pm 3\%$ ; it involves measuring the beat frequencies between transverse modes of a flat-mirror cavity containing the laser rod as an active element. After compensating an excellent optical quality rod with an external mirror, a brightness gain of about 100 was achieved simultaneously with single transverse mode operation ( $TEM_{00}$ ) at pump energies as

high as 40% over threshold. This procedure for achieving single transverse mode operation is advantageous compared to other methods since (1) no extra elements are needed in the cavity, (2) the beam divergence is near the diffraction limit for the rod holder, and (3) the  $TEM_{00}$  mode is not only selected but enhanced in volume, thus increasing the power output in this mode and the mode stability of the laser. (Author)

#### A67-16657

##### CHARACTERISTICS OF A TRAVELING-WAVE RUBY SINGLE MODE LASER AS A LASER RADAR TRANSMITTER.

I. Goldstein and A. Chabot (Raytheon Co., Space and Information Systems Div., Sudbury, Mass.). (Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)  
IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 519-523. 13 refs.  
Contract No. AF 33(657)-11659.

As part of a laser radar program, a single-mode ruby laser transmitter has been developed having a master oscillator with a power output of 20 kw, a pulse width of 1  $\mu$ sec and a repetition rate of 1 pulse/sec. The power amplifier has a measured gain of 24 db. The paper describes results obtained with this laser transmitter. The techniques to determine the key properties of this laser transmitter are described along with the actual results that have been obtained. The particular characteristics of interest are (1) coherence of the laser, (2) frequency shift of "chirp" during the pulse, and (3) method of achieving the single mode. (Author)

#### A67-16658

##### ABSORPTION AND EMISSION PROPERTIES OF OPTICALLY PUMPED RUBY.

Takashi Kushida (Tokyo Shibaura Electric Co., Ltd., Central Research Laboratory, Kawasaki, Japan). (Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)  
IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 524-531. 20 refs.

Several experiments on optically excited ruby are described. First, absorption transitions initiated from the metastable states,  $t_3^2 E$  and  $t_2^2 T_1$ , are investigated in the photon energy range from 5500 to 45,000 cm<sup>-1</sup>. The absorption spectrum of these excited states is determined in both  $\pi$ - and  $\sigma$ -polarizations and assignments for the observed absorption bands are achieved. Obtained results are compared with other experiments reported in the literature. Next, emission properties of pink ruby are studied in the region near the R lines. The emission spectrum is determined point by point by means of intense flash excitation. The observed weak bands are ascribed to the  $R^1$  and phonon assisted R transitions. Laser actions in these bands are discussed and experimental results on phonon terminated laser amplification are presented. An experiment using a giant pulse as an excitation source reveals that the transition time from  $t_3^2 E$  to  $t_2^2 T_1$  is shorter than a fraction of 1  $\mu$ s at room temperature. (Author)

#### A67-16660

##### OUTPUT SPECTRA OF Nd:YAG AND RUBY LASERS AND IMPLICATIONS FOR LASER LINEWIDTH DETERMINING MECHANISMS.

W. A. Specht, Jr., J. K. Neeland, and V. Evtuhov (Hughes Aircraft Co., Research Laboratories, Malibu, Calif.). (Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)  
IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 537-541. 17 refs.  
Contract No. AF 33(657)-11650.

The results of a number of experiments dealing with the output spectra of Nd:YAG and ruby lasers are presented. The aim of these experiments is to determine and clarify, at least qualitatively, the mechanisms responsible for the observed overall linewidths of Nd:YAG lasers. Two such mechanisms which may be expected to be present in solid-state lasers are inhomogeneous broadening of the fluorescent line, and slow spatial relaxation. In general, the

experiments have indicated that the situation in Nd:YAG is considerably less clear-cut than in ruby. Thus, in ruby the inhomogeneously broadened linewidth is quite narrow and, therefore, plays essentially no role in determining the linewidth of ruby laser output spectra. Instead, the overall linewidth seems to be determined entirely by effects caused by slow spatial relaxation. In Nd:YAG, depending on the particular rod, the laser linewidth can be determined by inhomogeneous broadening, spatial relaxation effects, or a combination of the two. Indications are that spatial relaxation is faster in Nd:YAG than in ruby. However, in good quality Nd:YAG rods, slow spatial relaxation still seems to play a dominant role.

(Author)

**A67-16661**

**CaF<sub>2</sub>:Sm<sup>2+</sup> LASER WITH RUBY LASER EXCITATION.**  
V. K. Koniukhov, V. M. Marchenko, and A. M. Prokhorov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR). (Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)  
*IEEE Journal of Quantum Electronics*, vol. QE-2, Sept. 1966, p. 541, 542. 7 refs.

CaF<sub>2</sub>:Sm<sup>2+</sup> laser action in temperature range 65 to 90°K is obtained with giant pulse ruby laser excitation. In addition to usual laser wavelength 0.708  $\mu$ , two other wavelengths 0.720 and 0.729  $\mu$ , known before only in luminescence, are observed for this oscillator. The oscillation duration is of 50 nsec and it coincides with the pumping light duration. The efficiency of energy transformation is equal to 20%.

(Author)

**A67-16662**

**THEORY OF PULSATING CONDITIONS FOR LASERS.**  
N. G. Basov, V. N. Morosov, and A. N. Oraevskii (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR). (Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)  
*IEEE Journal of Quantum Electronics*, vol. QE-2, Sept. 1966, p. 542-548. 18 refs.

A general equation is derived for the dynamical behavior of the laser. The analytic form of the family of solutions to this equation is found for the practically most important case of deep modulation of the laser output. The obtained results are used for studying a series of the following actual problems: external regulation of laser pulsation, establishment of continuous pulsating conditions for the maser and semiconductor lasers, and a study of periodic pulsations in a laser with a saturating filter.

(Author)

**A67-16663**

**THEORETICAL AND EXPERIMENTAL INVESTIGATION OF REGENERATIVE LASER AMPLIFIERS AND THEIR APPLICATIONS.**  
H. Boersch and G. Herziger (Berlin, Technische Universität, Physikalisches Institut, Berlin, West Germany). (Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)  
*IEEE Journal of Quantum Electronics*, vol. QE-2, Sept. 1966, p. 549-552. 7 refs.

The quality factor Q of optical resonators increases if the cavity losses are reduced by means of an active medium. In this case, the resonator works analogous to a classical rf amplifier, the amplification of which is increased by feedback. Significant for this amplifier type is increasing gain G and decreasing bandwidth  $\Delta\nu$  with increasing single-pass gain G<sub>0</sub>. An approximate theoretical treatment shows that the bandwidth root gain product should be a constant, or  $\Delta\nu/\sqrt{G} = \text{const}$ . Our experiments show that this relation is well performed at low signal intensities. At the point nearest to threshold a maximum gain of 20,000 and a minimum bandwidth of 2.10<sup>4</sup> cps was realized. The amplifier device was used for a measurement of electron densities down to 3 x 10<sup>12</sup> cm<sup>-3</sup> in a helium plasma.

(Author)

**A67-16664**

**LASER EMISSION AT 1.06  $\mu$  FROM Nd<sup>3+</sup>-Yb<sup>3+</sup> GLASS.**  
E. Snitzer (American Optical Co., Southbridge, Mass.). (Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)  
*IEEE Journal of Quantum Electronics*, vol. QE-2, Sept. 1966, p. 562-566. 13 refs.

Laser emission at 1.015  $\mu$  occurs in glass singly doped and when sensitized with Nd<sup>3+</sup>. For double doping in an Li Mg Al Si glass, emission at 1.015  $\mu$  from Yb<sup>3+</sup> and 1.06  $\mu$  from Nd<sup>3+</sup> was reported. By monitoring the 1.35- $\mu$  fluorescent line of Nd<sup>3+</sup>, it can be shown that both Nd<sup>3+</sup> and Yb<sup>3+</sup> lase at 1.06  $\mu$  at room temperature in a silicate glass with 5 wt% Nd<sub>2</sub>O<sub>3</sub> and 5 wt% Yb<sub>2</sub>O<sub>3</sub>. Energy transfer from Nd<sup>3+</sup> to Yb<sup>3+</sup> is a linear function of the Yb<sup>3+</sup> concentration. The transfer increases with Nd<sup>3+</sup> concentration by about a factor of three in going from 1 wt% Nd<sub>2</sub>O<sub>3</sub> to 6 wt% Nd<sub>2</sub>O<sub>3</sub> and thereafter remains approximately constant. This indicates that the transfer from Nd<sup>3+</sup> to Yb<sup>3+</sup> is assisted by intermediate transfer steps between Nd<sup>3+</sup> ions. Additional transfer above 6 wt% Nd<sub>2</sub>O<sub>3</sub> is prevented by concentration quenching.

(Author)

**A67-16665**

**INVESTIGATION OF THE SCATTERING OF LASER LIGHT BY A PLASMA.**  
W. H. McMahan and J. R. Bowen (Martin Marietta Corp., Martin Co., Orlando, Fla.). (Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)  
*IEEE Journal of Quantum Electronics*, vol. QE-2, Sept. 1966, p. 567-579. 11 refs.

In experimental studies, light from a continuous-wave argon ion laser was scattered by an argon plasma generated by a theta pinch. Resonance scattering was observed both by angular scattering techniques and by interferometry. The scattering data were correlated with properties of the plasma by measuring the time resolved spectra of the plasma. The time resolved density of excited states of argon II was measured, and the relationship of these density data to local thermal equilibrium in the plasma is discussed.

(Author)

**A67-16666**

**LASER ACTION BY ENHANCED TOTAL INTERNAL REFLECTION.**  
Charles J. Koester (American Optical Co., Research Div., Southbridge, Mass.). (Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)  
*IEEE Journal of Quantum Electronics*, vol. QE-2, Sept. 1966, p. 580-584. 8 refs.

USAF-supported research.

Oscillation and amplification have been observed in a fiber in which the core is passive glass and the cladding is neodymium-doped glass. As in conventional fiber optics, the refractive index of the core is greater than that of the cladding, so that light is carried in the core by total internal reflection. The results are interpreted as meaning that the reflection coefficient at the interface between passive core and laser cladding is greater than unity. Expressed in waveguide terminology, modes which are guided by the high index passive core, but have a substantial portion of their energy in the cladding, can be amplified by means of an active cladding.

(Author)

**A67-16667**

**THE NATURE OF THE LASER-TRANSITION IN CdS CRYSTAL AT 90°K WITH TWO-PHOTON EXCITATION.**  
L. A. Kulevskii and A. M. Prokhorov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR). (Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)  
*IEEE Journal of Quantum Electronics*, vol. QE-2, Sept. 1966, p. 584-586. 10 refs.

An oscillation at the wavelength 4946 Å in CdS crystal is produced by two-photon excitation by ruby laser radiation. A two-photon absorption coefficient is measured at 6943 Å. The two-photon absorption coefficient is proportional to the light beam intensity and is equal to  $1.0 \text{ cm}^{-1}$  at  $50 \text{ mw/cm}^2$ . The excitation lifetime in excited state is  $10^{-9}$  to  $10^{-11}$  sec. It is proved that the oscillation in CdS is due to the coupled excitations. (Author)

#### A67-16668

##### SEMICONDUCTOR LASERS AND FAST DETECTORS IN THE INFRARED (3 TO 15 MICRONS).

M. Rodot, C. Verie, Y. Marfaing (Centre National de la Recherche Scientifique, Bellevue, Seine-et-Oise, France), J. Besson, and H. Lebloch (Société Anonyme de Télécommunications, Paris, France).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 586-593. 7 refs.

Research supported by the Direction des Recherches et Moyens d'Essais.

Small-energy-gap semiconductors such as InAs, InSb, and  $\text{Hg}_{1-x}\text{Cd}_x\text{Te}$  (where  $0.15 \leq x \leq 0.40$ ) allow one to build infrared coherent emitters and fast detectors in a wide wavelength range where practical applications are anticipated (3 to  $15 \mu$ , approximately). Some recent achievements of these devices are presented. Previously described indium arsenide junction lasers have been improved. Continuous emission is obtained at  $27^\circ\text{K}$ , at a level of 20 mw. Relaxation oscillations of the emitted coherent radiation have been observed at a frequency of 20 Mc. Sublaser emission has been observed at  $3 \mu$  on  $\text{HgTe-CdTe}$  alloy p-n junctions. Coherent emission can be predicted on the basis of the band structure. The intrinsic detectors are faster and can work at higher temperatures than impurity photoconductors. Besides photovoltaic InAs and InSb detectors, three types of  $\text{Hg}_{1-x}\text{Cd}_x\text{Te}$  detectors have been developed for the 3- to  $12\text{-}\mu$  wavelength range: photovoltaic, photoconductive cells, and graded band-gap structures. Theoretical possibilities of this type are discussed and preliminary experimental results for all three are given. For a photoconductive cell whose response peaks at  $10 \mu$  a time constant of 70 nsec has been measured using an InAs laser as a source. (Author)

#### A67-16669

##### SEMICONDUCTOR LASERS WITH RADIATING MIRRORS.

N. G. Basov, O. V. Bogdankevich, and A. Z. Grasiuk (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 594-597. 25 refs.

High semiconductor gain coefficients (several hundreds of reverse cm) allow obtaining light generation by means of thin films imposed on the Fabry-Pérot resonator mirror surface. In this case, semiconductor excitation can be produced by either light or an electron beam. With the help of such generators it becomes possible to significantly increase radiation energy and to improve its coherence. Coherent summing up of the radiation energy of several separate semiconductor or other types of lasers can be made through such a kind of system. At present, semiconductor lasers with radiating mirrors are developed by excitation using both an electron beam and a radiation of neodymium laser glass. (Author)

#### A67-16670

##### LINEWIDTH MEASUREMENTS OF CW GALLIUM ARSENIDE LASERS AT $77^\circ\text{K}$ .

W. E. Ahearn and J. W. Crowe (International Business Machines Corp., Thomas J. Watson Research Center, Yorktown Heights, N.Y.).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 597-602. 5 refs.

Measurements have been made on the linewidths of several continuously excited GaAs lasers operating at  $77^\circ\text{K}$  by using an optical system similar to that of a Michelson interferometer with a leg unbalance of 3000 ft. For CW GaAs lasers operating in a single mode, homodyne detection was used to determine the linewidth to within the system's resolution of 150 kc. For various CW GaAs laser current levels and mode configurations, the system allowed a means of determining the bandwidth of the intensity noise by autocorrelation. (Author)

#### A67-16671

##### DIRECT FREQUENCY MODULATION OF A SEMICONDUCTOR LASER BY ULTRASONIC WAVES.

J. E. Ripper, G. W. Pratt, Jr., and C. G. Whitney (Massachusetts Institute of Technology, Center for Materials Science and Engineering, Materials Theory Group, Cambridge, Mass.).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 603-605. 9 refs.

Army-ARPA-supported research.

Discussion of frequency-modulation of a semiconductor laser using ultrasonic waves. The principle used is the modulation of the dielectric constant of the material by the sound waves. This modulates the laser output due to the refractive index dependence of the mode frequencies. It is shown that a very high index of modulation can be achieved. Experimental results are reviewed for a gallium arsenide diode laser. Limitations of this technique and possible devices are considered. (Author)

#### A67-16672

##### THE THEORY OF SEMICONDUCTOR LASERS WITH CONSIDERATION OF SATURATION EFFECTS.

O. N. Krokhin (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 605-607.

Semiconductor behavior in strong fields having a frequency close to the absorption band is considered. It is proved that only the slowing down and recombination times of four different relaxation times are of importance for weaker fields. In this case, equality of Fermi level electron and hole quasi-levels to light quantum energy corresponds to a saturation condition. A semiconductor absorption coefficient regarding saturation is calculated. (Author)

#### A67-16673

##### THEORY OF THE INTERBAND MAGNETOOPTICAL SEMICONDUCTOR LASER.

B. Sacks and B. Lax (Massachusetts Institute of Technology, National Magnet Laboratory, Cambridge, Mass.).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 607-610. 11 refs.

The operation of the interband magneto-optical semiconductor laser has been realized by two techniques - injection and optical pumping. This paper considers the theory of the electromagnetic modes and threshold conditions which can be applied to either of these configurations. In addition, the bulk magneto-optical laser, which can in principle be realized by electronbeam pumping, is also considered. Because of the mode-coupling due to the magnetic field, neither TE nor TM modes alone are adequate to describe the electromagnetic wave propagating in the laser. Moreover, an exact solution of the complete boundary value problem is not feasible. However, we have derived an expression for the propagation constant by using a linear combination of the TE and TM modes given at zero field in a perturbation theory. This expression is in terms



of the propagation constants of the unperturbed TE and TM modes and the perturbation of the conductivity tensor due to the magnetic field.

(Author)

#### A67-16674

CaF<sub>2</sub>Dy<sup>2+</sup> GIANT PULSE LASER WITH HIGH REPETITION RATE.

V. V. Kostin, L. A. Kulevskii, T. M. Murina, A. M. Prokhorov, and A. A. Tikhonov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 611, 612.

Description of an experiment in which a giant pulse laser action with high repetition rate is obtained in CaF<sub>2</sub>Dy<sup>2+</sup> using a dc pumping xenon lamp. The laser parameters are: radiation wavelength of 2.36  $\mu$ , pulse duration of  $1.2 \times 10^{-2}$  nsec, pulse maximum power output of 2 kw, and repetition frequency of 200 cps.

M. F.

#### A67-16675

THE INFLUENCE OF Nd<sup>3+</sup> ION PROPERTIES IN A GLASS MATRIX ON THE DYNAMICS OF A Q-SPOILED LASER.

Maurice Michon (Compagnie Générale d'Electricité de Paris, Centre de Recherches, Département Recherches Physiques de Base, Marcoussis, Seine-et-Oise, France).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 612-616. 7 refs.

Application of the Lengyel and Wagner model to the calculation of the terminal level ( $4I_{11/2}$ ) of action of a neodymium laser at 1.06  $\mu$ . It is found that during Q-switched laser action, the  $4I_{11/2}$  level becomes rapidly populated through stimulated emissions from the  $4F_{3/2}$  level. This  $4I_{11/2}$  population decreases as the pulse duration increases from 25 to 90 nsec which indicates a  $4I_{11/2}$  lifetime on the order of a few tens of nanoseconds. After the introduction of a fourth level to the three-level Lengyel and Wagner model with a finite lifetime, the prediction of this simplified theory was found to correlate well with the experiment. It is not possible to obtain for the  $4I_{11/2}$  lifetime estimates of more than one order of magnitude.

M. F.

#### A67-16676

FEEDBACK CONTROL OF A Q-SWITCHED RUBY LASER.

C. H. Thomas (Edgerton, Germeshausen, and Grier, Inc., Goleta, Calif.) and E. V. Price (General Electric Co., Defense Programs Div., TEMPO, Santa Barbara, Calif.).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 617-623. 14 refs.

AEC Contract No. AT (29-1)-1183.

An experimental laser configuration used to investigate controlling by feedback the emission of a fully-pumped Q-switched ruby laser is described. The objective has been to develop a laser system capable of emitting a 10-kw rectangular pulse of from 5 to 10  $\mu$ sec. Feedback control of the laser has been achieved. However, an hf instability observed in a small portion of each pulse must be eliminated to give the desired constant amplitude. Theoretical calculations based on a mathematical model of the feedback-controlled laser correlate dramatically with experimental results in predicting the frequency and the onset time of the instability. A mathematical model of the laser is presented. Derivations of the equations that govern beam intensity and other variables are described in detail, and techniques for obtaining computer solutions are discussed. Validity of the model has been demonstrated by the good correlation of computer results with experimental measurements.

(Author)

#### A67-16677

EXPERIMENTAL STUDIES OF SATURABLE OPTICAL ABSORPTION.

F. Gires (Compagnie Générale de Télégraphie sans Fil, CEPCA, Orsay, Seine-et-Oise, France).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 624-626. 9 refs.

From previous publications, the optical absorption of several substances has been found to depend in a reversible way on the incident light flux of a high intensity laser. Moreover, it has been observed that the absorption decreases not only at the laser wavelength but simultaneously within a large band around this wavelength. These effects may be explained by a time-dependent population distribution among the different excited states of absorbing molecules during the strong laser excitation. The present experimental results make it possible to determine the different time constants of importance in this phenomenon.

(Author)

#### A67-16678

SATURABLE ABSORPTION OF COLOR CENTERS IN Nd<sup>3+</sup> AND Nd<sup>3+</sup>-Yb<sup>3+</sup> LASER GLASS.

E. Snitzer and R. Woodcock (American Optical Co., Southbridge, Mass.).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 627-632. 9 refs.

By saturated absorption of color centers in glass, self-Q-switched pulses are obtained, as in glass codoped with UO<sub>2</sub><sup>2+</sup> and Nd<sup>3+</sup>. One of the commonly used laser glasses contains 5 wt% Nd<sub>2</sub>O<sub>3</sub> in a glass base consisting of 72 wt% SiO<sub>2</sub>, 11 K<sub>2</sub>O, 8 Na<sub>2</sub>O, 1 Li<sub>2</sub>O, 5 BaO, 2 Al<sub>2</sub>O and 1 Sb<sub>2</sub>O<sub>3</sub>. The antimony is added for bubble removal in making the glass and to prevent solarization. If the antimony is left out, color centers are produced by ultraviolet light whose wavelength is shorter than 300 nm. Three broad absorption bands result, which are stable at room temperature. They are centered at 310, 450, and 620 nm. The stable color centers are bleached on exposure to visible or ultraviolet light of wavelength longer than 300 nm and they are completely bleached after heating to 200°C for one hour. Additional color centers are produced with room temperature decay times short enough so that they are in the glass only while the ultraviolet from the flashlamp is present. At 300°K, the short-lived color centers give a 5%/cm at 1  $\mu$  and are responsible for saturated absorption in the laser.

(Author)

#### A67-16679

LASER OPERATION WITH LIQUID SEMICONDUCTOR MIRRORS.

M. Birnbaum and T. L. Stocker (Aerospace Corp., El Segundo, Calif.).

(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 632-635.

Contract No. AF 04(695)-669.

Q-switched laser operation has been observed using a liquid selenium mirror as one of the reflectors in a ruby laser. Detailed measurements of the changes in reflectivity of liquid selenium under ruby laser giant pulse excitation were obtained using a pulsed argon ion laser to monitor the reflectivity variations. With liquid selenium, an initial decrease in reflectivity was observed, which was followed by oscillations. The initial decrease was attributed to deformation of the liquid surface by heating. The Q-switched behavior is attributed to the periodic deformation and heating of the liquid selenium mirror.

(Author)

#### A67-16680

SPECTROSCOPIC STUDIES OF GAS DISCHARGES USED FOR ARGON ION LASERS.

V. F. Kitaeva, Iu. I. Osipov, and N. N. Sobolev (Akademii Nauk SSSR, Fizicheskii Institut, Moscow, USSR).  
(Institute of Electrical and Electronics Engineers, International Quantum Electronics Conference, 4th, Phoenix, Ariz., Apr. 12-15, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 635-637. 7 refs.

Investigation of the main characteristics of the argon discharge used in the continuous-action ion laser required for an analysis of the mechanism of inversion production. These include ion and electron densities and ion temperatures as a function of current density. M.F.

#### A67-16681

##### COHERENCE EFFECTS IN MULTIPHOTON ABSORPTION PROCESSES.

John G. Meadors (Ohio University, Dept. of Electrical Engineering, Athens, Ohio).

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 638-644. 9 refs.

Contract No. AF 33(615)-2287.

The statistical properties of light such as that from an optical maser are related to the observable characteristics of multiphoton absorption processes. It is shown that multiphoton absorption provides a technique for investigating the coherence properties of intense light sources. Several simple models for the radiation field are considered, and the statistical properties of these models are derived and discussed. (Author)

#### A67-16682

##### QUENCHING EFFECTS IN COUPLED LASERS.

R. H. Pantell (Stanford University, Stanford, Calif.) and P. W. Phenegeer.

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 644-648.

USAF-sponsored research.

The quenching of one pulsed ruby laser oscillation by another is investigated. Coupled rate equations, which yield both the steady-state and transient behavior of two coupled lasers, are the basis of a theoretical analysis of the interaction. An experimental investigation of the effect has been performed, and comparisons between theory and experiment are favorable. (Author)

#### A67-16683

##### ON THE THEORY OF STIMULATED BRILLOUIN SCATTERING WITH STOKES FEEDBACK.

P. Lambropoulos, S. Kern (Bendix Corp., Research Laboratories Div., Southfield, Mich.), and R. K. Mueller (Bendix Corp., Research Laboratories Div., General Science and Technology Laboratory, Southfield, Mich.).

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 649-658. 14 refs.

The interaction of hypersound and light inside a laser cavity with Stokes feedback is studied. Quantum equations of motion for the creation operators of the laser and Stokes modes, and the acoustic mode coupled to them, are derived. Using the quasi-classical approximation, these equations are transformed into a system of nonlinear differential equations for the classical field amplitudes. Stationary solutions of the system are obtained and the conditions under which such solutions exist are determined. Instability criteria are also established. (Author)

#### A67-16684

##### THEORY OF A TUNABLE RAMAN LASER.

P. A. Wolff (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 659-665. 14 refs.

Observation that mobile electrons in semiconductors, when subjected to a magnetic field, Raman-scatter at a frequency which is shifted from that of the incident light by twice the electron cyclotron frequency. This process may provide the mechanism for a

tunable Raman laser. A formula is derived for the threshold pump power required to stimulate such Raman emission. N-type InSb pumped by a 10.6- $\mu$  CO<sub>2</sub> laser appears to be a good combination for achieving laser action. Pump powers of 1 to 10 Mw/cm<sup>2</sup> are required for operation in the wavelength range from 12 to 25  $\mu$ . Such power densities have been achieved with pulsed CO<sub>2</sub> lasers. Stimulated Raman emission at wavelengths beyond 60  $\mu$  is also a possibility. The threshold pump power in the range is comparable to that in the near IR. To shift the Raman frequency into the far IR, however, magnetic fields greater than 100 kgauss are required. M.F.

#### A67-16685

##### ON THE STABILIZATION OF A HIGH-POWER SINGLE-FREQUENCY LASER.

P. W. Smith (Bell Telephone Laboratories, Inc., Crawford Hill Laboratory, Holmdel, N.J.).

(Institute of Electrical and Electronics Engineers, 1966 Conference on Electron Device Research, Pasadena, Calif., June 29-July 1, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 666-668. 6 refs.

A single-mode 6328 Å He-Ne laser is described which has a single-frequency power output of 50 mwatt. A method of stabilizing the output of this laser is described, and experimental results are quoted to show that the output can be stabilized to the resonance frequency of a stable reference cavity to within  $\pm 1$  Mc. This stabilization scheme has two advantages over an earlier scheme used with such a single-mode laser: (1) the output is neither amplitude- nor frequency-modulated by the feedback system, and (2) the output coupling may be continuously varied so that optimum output may be obtained without experimenting with mirrors of various transmissivities. (Author)

#### A67-16686

##### INFORMATION ON SATURATION AND GAIN OF GAS LASERS FROM MODULATION EXPERIMENTS.

P. T. Bolwijn (Utrecht, Rijksuniversiteit, Fysisch Laboratorium, Utrecht, Netherlands).

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 670, 671. 7 refs.

Discussion of single-mode output power modulation, obtained via excitation density or via resonator Q-modulation as a very sensitive method for studying both the unsaturated net gain and the saturation behavior of gas laser transitions. Modulation experiments with a dc excited short planar He-<sup>20</sup>Ne laser operating in a single axial mode at 1.15- $\mu$  wavelength were performed. A decrease of modulated power output with increase of excitation level was observed. Further analysis shows that information on the unsaturated net gain may be gained from a measurement of output power modulation amplitude vs modulation frequency, and from a measurement of the phase angle difference between the output modulation signal and the driving modulation signal. M.F.

#### A67-16687

##### COMMENT ON "ENHANCED LASING OF THE HIGH PRESSURE He-Ne LASER."

P. Burlamacchi (Consiglio Nazionale delle Ricerche, Centro Microonde, Florence, Italy) and R. Pratesi (Firenze, Università, Istituto di Fisica Superiore, Florence, Italy).

IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 671-673. 8 refs.

Research supported by the Consiglio Nazionale delle Ricerche.

Investigation of the stimulated laser emission at 1.15  $\mu$  in the case of double pulse excitation, using a 10-mm-diam laser tube with two confocal mirrors of 1200-mm radius of curvature. The results of the experiment are compared with those obtained by Toyoda and Yamanaka in a similar experiment. M.F.

#### A67-16688

##### OPTICAL HETERODYNE DETECTION OF STIMULATED BRILLOUIN SCATTERING IN QUARTZ.

## A67-16785

Alan S. Pine (Harvard University, Div. of Engineering and Applied Physics, Gordon McKay Laboratory, Cambridge, Mass.).  
IEEE Journal of Quantum Electronics, vol. QE-2, Sept. 1966, p. 673, 674. 9 refs.

ARPA-supported research.

Theoretical and experimental study showing that optical heterodyne techniques make it possible to detect stimulated Brillouin scattering with high precision and sensitivity. The frequency shift demodulated in this experiment is 25.55 GHz arising from ordinary ray, ruby laser light incident on an X cut quartz crystal at room temperature. On the order of 0.1 watt of Brillouin shifted signal is detectable with comparable local oscillator power. Thus, the sensitivity is greatly enhanced over previous Brillouin heterodyne experiments and the frequency range of photomixing is extended to the K-band microwave region.

M. F.

## A67-16785

### MEASUREMENTS ON THE MOLECULAR NITROGEN PULSED LASER.

Takahiro Kasuya and David R. Lide, Jr. (National Bureau of Standards, Washington, D.C.).

Applied Optics, vol. 6, Jan. 1967, p. 69-80. 16 refs.

Accurate wavelength measurements of the pulsed laser emission from the nitrogen molecule have been made. About 100 new stimulated emission lines which belong to the first and second positive systems were obtained and identified as to rotational quantum number. The relative intensities of the laser lines in the rotational band spectrum are analyzed. Some characteristics of the oscillations, including the recovery time after the laser pulse, are discussed.

(Author)

## A67-16786

### LASER PROBE EXCITATION IN SPECTROCHEMICAL ANALYSIS. I. II.

Stanley D. Rasberry, Bourdon F. Scribner, and Marvin Margoshes (National Bureau of Standards, Washington, D.C.).

Applied Optics, vol. 6, Jan. 1967, p. 81-93. 17 refs.

Description of a modified laser probe for spectrochemical analysis. At high-energy laser beam is focused onto a specimen to vaporize a sample from a small area, and the vapor thus formed is further excited by a spark discharge. The characteristics of emission spectra with and without auxiliary spark excitation are compared. Spectrograph illuminating systems for qualitative and quantitative analysis were investigated. Some difficulties were encountered with the laser probe and modifications were made to the instrument to alleviate some of these problems. Some typical analytical applications are discussed. Correlations have been established between the energy of the laser beam, the size of the pit formed, and spectral intensities. For most purposes, single-spike laser operation has been found to be preferable to multiple-spike operation. At present, the coefficients of variation for analysis are 15 to 40%.

M. F.

## A67-16792

### OBJECT-IMAGE RELATIONSHIPS IN SCATTERED LASER LIGHT.

N. R. Isenor (Waterloo, University, Dept. of Physics, Waterloo, Ontario, Canada).

Applied Optics, vol. 6, Jan. 1967, p. 163. 5 refs.

Research supported by the National Research Council of Canada.

Discussion of object-image relationships that exist when diverging or converging laser beams are scattered from nonspecular surfaces. The object-image displacement ratios are plotted against the object (laser focus) position.

M. F.

## A67-16793

### ON THE WAVELENGTH DEPENDENCE OF THE SPECTRUM OF LASER BEAMS TRAVERSING THE ATMOSPHERE.

T. S. Chu (Bell Telephone Laboratories, Inc., Crawford Hill Laboratory, Holmdel, N.J.).

Applied Optics, vol. 6, Jan. 1967, p. 163, 164. 8 refs.

Preliminary results of an experiment that determined the wavelength dependence of the low-frequency spectrum of the fluctuation of optical waves propagated through the atmosphere. It is found that the spectrum width decreases with increasing wavelength. The rate of decrease of the spectrum width appears to be less than the inverse square root of the wavelength as predicted by Tatarski's theoretical model, which assumes a constant mean velocity of air motion across the path and a frozen-in condition for the refractive index inhomogeneities.

M. F.

## A67-16794

### DAMAGE IN GLASS INDUCED BY LINEAR ABSORPTION OF LASER RADIATION.

R. A. Miller and N. F. Borrelli (Corning Glass Works, Corning, N.Y.).

Applied Optics, vol. 6, Jan. 1967, p. 164, 165.

Examination of focused, non-Q-spoiled laser damage of glasses with small optical absorption at the laser wavelength. Tabulated data include: the glasses investigated, the measured optical absorption coefficients at 1.06 and 0.694  $\mu$ , and the approximate laser energy density to which these were subjected at the two wavelengths. The most conclusive evidence that absorption is the dominant factor is indicated by the Code 0580, X95DTA results.

M. F.

## A67-16821

### THE ONSET OF OSCILLATION IN A He-Ne LASER.

L. Allen, D. G. C. Jones, and M. D. Sayers (Sussex, University, School of Mathematical and Physical Sciences, Brighton, England).

IEEE Journal of Quantum Electronics, vol. QE-2, Oct. 1966, p. 690-692. 6 refs.

A simple experimental technique is described for the study of the onset of oscillation in a He-Ne laser. The risetime of the 6328-Å laser oscillation is found to be of the order of 100  $\mu$ sec and to be a function of gain. The results are analyzed using the Lamb semiclassical theory, and a value of  $75 \pm 5 \mu$ sec is obtained for the time constant for population of the lower laser level. The significance of the results is discussed with respect to those of other workers.

(Author)

## A67-16823 \*

### THRESHOLD OF MULTIMODE PARAMETRIC OSCILLATORS.

S. E. Harris (Stanford University, Dept. of Electrical Engineering, Stanford, Calif.).

IEEE Journal of Quantum Electronics, vol. QE-2, Oct. 1966, p. 701, 702.

Grant No. NGR-09-020-103.

Consideration of the threshold of a parametric system having a set of idler modes with the same  $c/2L$  frequency spacing as a laser pump source, all coupled through a nonlinear element to a single signal mode. The multimode nature of many practical laser pump sources is treated.

F. R. L.

## A67-16855 #

### LASER NEODYMIUM GLASS [LASEROWE SZKŁO NEODYMOWE].

Bohdan Paszkowski, Wiesław Wołński, Antoni Kaźmirowski, Marian Nowicki (Warszawa, Politechnika, Katedra Przyrządów Elektronowych, Warsaw, Poland), and Leszek Hilgertner (Zakłady Szklarskie, Ożarów, Poland).

Pomiary, Automatyka, Kontrola, vol. 12, Dec. 1966 (Optyka, vol. 2, Dec. 1966, p. 62, 63. 11 refs.). In Polish.

Brief survey of the properties of optical glasses doped with rare-earth elements, employed in laser technology. The results obtained with neodymium glass in laser applications are reviewed, and the difficulties involved in the production of high-quality neodymium glass are noted.

V. P.

**A67-16914 #**

INTERNAL MODULATION OF AN INFRARED LASER [VNUTRENNIAIA MODULIATSIYA INFRAKRASNOGO LAZERA].

E. R. Mustel', V. N. Parygin, and V. S. Solomatin.

*Radiotekhnika i Elektronika*, vol. 11, Dec. 1966, p. 2245-2247. 5 refs. In Russian.

Experimental investigation of the internal modulation of a gas laser operating at a frequency of 3.39 and employing CdS and CdSe single crystals of the  $C_{6v}$  type as the electro-optical crystals. Curves are given showing the relative light intensity as a function of the voltage applied to the crystal and on the modulating voltage for various values of the discharge current, and the dependence of the modulation depth on the alternating voltage. V.P.

**A67-16921 =**

THE LASER AS A SOURCE OF OPTICAL FOURIER TRANSFORMS [LAZER KAK ISTOCHNIK DLIYA OPTICHESKOI TRANSFORMATSII FUR'E].

B. K. Vainshtein and G. I. Kosourov (Akademiia Nauk SSSR, Institut Kristallografii, Moscow, USSR).

*Kristallografiia*, vol. 11, Nov.-Dec. 1966, p. 921-923. In Russian.

Application of a laser to the optical summation of Fourier series in the analysis of the atomic structure of crystals. Examples of "masks" simulating the reciprocal lattice are given, together with the corresponding optical Fourier transforms. A diffraction pattern from an electromicroscopic photograph of the crystal structure of catalase is included. V.P.

**A67-16922 #**

CERIC FLUORITE WITH NEODYMIUM ADDITIONS AS AN ACTIVE MEDIUM FOR LASERS [TSERFLUORIT S PRIMES'IU NEODIMA KAK AKTIVNAIA SREDA DLIYA OPTICHESKIKH KVANTOVYKH GENERATOROV].

Iu. K. Voron'ko, A. A. Kaminskii, V. V. Osiko, and M. M. Fursikov (Akademiia Nauk SSSR, Fizicheskii Institut and Institut Kristallografii, Moscow, USSR).

*Kristallografiia*, vol. 11, Nov.-Dec. 1966, p. 936-938. 11 refs. In Russian.

Investigation of the absorption, luminescence and induced radiation of  $\text{CaF}_2\text{-CeF}_3$  with  $\text{Nd}^{3+}$  additions. The absorption spectrum of an  $\text{CaF}_2\text{-CeF}_3$  crystal with a 0.5-wt% content of  $\text{Nd}^{3+}$  at 300°K and the luminescence spectra of such a crystal containing 1 wt%  $\text{Nd}^{3+}$  at 77 and 300°K are given and discussed. V.P.

**A67-16935 #**

APPLICATION OF VARIATIONAL METHODS TO A STUDY OF THE TEMPERATURE REGIME OF THE ACTIVE MEDIA OF PULSED LASERS [PRIMENENIE VARIATSIONNYKH METODOV K ISSLEDOVANIU TEMPERATURNOGO REZHIMA AKTIVNYKH TEL IMPUL'SNYKH OPTICHESKIKH KVANTOVYKH GENERATOROV].

L. I. Kudriashev, B. R. Belostotskii, and N. L. Kudriasheva (Leningradskoe Optiko-Mekhanicheskoe Ob'edinenie, Leningrad, USSR).

*Akademiia Nauk BSSR, Doklady*, vol. 10, Nov. 1966, p. 835-839. In Russian.

Determination of the temperature field of the active medium of a pulsed laser by means of variational methods. Two possible approximate solutions of the system of equations representing the temperature field of the active medium during the process of cooling between discharges of the pumping tubes are considered - one being based on the use of Leibenzon's integral relation, while the other is based on the use of the Ritz method. A. B. K.

**A67-16948**

LOW-FREQUENCY OSCILLATIONS IN A He-Ne LASER.

N. Konjević and K. R. Hearne (Liverpool, University, Dept. of Electrical Engineering and Electronics, Liverpool, England). *Electronics Letters*, vol. 2, Dec. 1966, p. 461.

It is shown that the amplitude of low-frequency oscillations (30-100 kHz) which occur in dc He-Ne lasers can be reduced appreciably by applying a localized magnetic field of about 50 gauss in the cathode-fall region. (Author)

**A67-16975 #**

RUBY CRYSTALS GROWN BY THE CZOCHRALSKI TECHNIQUE. Mitsuhiro Maruyama (Nippon Electric Co., Ltd., Central Research Laboratories, Kawasaki, Japan).

*Japanese Journal of Applied Physics*, vol. 5, Nov. 1966, p. 1026-1028. 9 refs.

Ruby crystals were grown by the Czochralski technique by using an induction-heated iridium crucible in various atmospheres. The crystals are grown along directions of the a- and c-axes and of 60° from the c-axis. The crystal on the whole is free from residual stresses, in contrast to the remarkable and irregular stresses usually found in crystals grown by the Verneuil technique. Laser oscillation was observed in the pulled crystals. (Author)

**A67-16979 #**

DEPENDENCES OF OUTPUT POWERS ON THE DISCHARGE CURRENT IN SINGLE-LINE AND TWO-LINE OSCILLATIONS OF He-Ne LASERS.

Shigeo Asami (National Research Laboratory of Metrology, Tokyo, Japan).

*Japanese Journal of Applied Physics*, vol. 5, Nov. 1966, p. 1075-1083. 18 refs.

A general method of expressing the output powers of gaseous lasers on a single line or simultaneous oscillations on two lines as a function of pumping rates and transition probabilities is developed from the standpoint of an electronic network analog of the rate equations. By application of this method to the 1.15- $\mu$ , 6328-Å, and 3.39- $\mu$  lines of He-Ne lasers, the dependences of their powers on the discharge current are discussed and found to be in agreement with experimental results. Furthermore, examples of simultaneous oscillations of the 1.15- $\mu$  and 6328-Å lines as well as those of the 6328-Å and 3.39- $\mu$  lines are treated, giving results which are also in agreement with experimental results. Features of the dependences of the output powers on the discharge current in the simultaneous oscillations are stated in connection with those in the single-line oscillations. (Author)

**A67-16980 #**

TRANSIENT BEHAVIOR OF He-Ne LASERS.

Misao Ohi (National Research Laboratory of Metrology, Tokyo, Japan).

*Japanese Journal of Applied Physics*, vol. 5, Nov. 1966, p. 1084-1093. 7 refs.

Experimental investigation of an He-Ne laser (1.15  $\mu$ ) under pulsed hf excitation. The existence of a delay in oscillation buildup was revealed, as was a peak in the output at the beginning of the oscillation. From qualitative discussions of the behavior of photon density and inversion density on the basis of coupled rate equations, these transient phenomena are shown to be reasonable. The contributions of various factors related to a lasing mechanism are clarified from numerical calculations of simplified rate equations by the use of electronic computers. Both loss terms for the photon and the inversion strongly affect the shape of the curve of the solution. The increase in the former produces an oscillating buildup, while the latter has an opposite effect. The resultant contribution of the loss terms is analyzed. A reasonable set of the coefficients is found to lead to a solution which agrees with the experimental results. M.M.

**A67-17008 #**

GAS-DYNAMIC PROCESSES IN THE HEATING OF A SUBSTANCE BY LASER RADIATION [GAZODINAMICHESKIE PROTSESSY PRI NAGREVANII VESHCHESTVA IZ LUCHENIEM LAZERA].

Iu. V. Afanas'ev, V. M. Krol', O. N. Krokhin, and I. V. Nemchinov (Akademiia Nauk SSSR, Institut Fiziki Zemli and Fizicheskii Institut, Moscow, USSR).

*Prikladnaia Matematika i Mekhanika*, vol. 30, Nov.-Dec. 1966, p. 1022-1028. 5 refs. In Russian.

Theoretical investigation of the heating process and gas-dynamic motion of a substance under the effect of laser radiation. Solutions are obtained for the heating of finite transparent gas and of an initially cold and motionless gas situated at a vacuum interface. A distinctive feature of the latter problem is the exact solution of the gas-dynamic equations in the case of a variable mass set in motion

by a powerful laser pulse. This solution may be used for the approximate description of the evaporation and heating processes in a solid exposed to laser radiation in a vacuum. V. P.

**A67-17028 #**

BEHAVIOR OF BENZENE AND SOME OTHER ORGANIC COMPOUNDS IN A FOCUSED LASER BEAM [O POVEDENII BENZOLA I NEKOTORYKH DRUGIKH ORGANICHESKIKH SOEDINENII V SFOKUSIROVANOM LAZEROM PUCHKE].

O. V. Bragin, O. F. Kulikov, A. L. Liberman, and B. A. Kazanskii (Akademiia Nauk SSSR, Institut Organicheskoi Khimii; Moskovskii Gosudarstvennyi Universitet, Moscow, USSR).

Akademiia Nauk SSSR, Doklady, vol. 171, Nov. 21, 1966, p. 616-618. 6 refs. In Russian.

Brief account of a study at room temperature of the effect of ruby and neodymium laser beams on benzene, n-heptane, cyclohexane, cyclopentane, cyclopentene, 1,2-dichlorocyclopentane, and acrylonitrile. Even after exposure to only a few pulses, a dark readily coagulating deposit was formed in benzene when the diameter of the laser beam was less than 3 to 4 mm. A similar but weaker effect was observed in 1,2-dichlorocyclopentane and cyclopentene; it was weaker or nonexistent in the other compounds. The deposit contained roughly 98% C and 0.5% H. V. Z.

**A67-17057 #**

KINETICS OF THE FORMATION AND HEALING OF THE DAMAGE CAUSED BY A LASER BEAM IN LITHIUM FLUORIDE SINGLE CRYSTALS [KINETIKA OBRAZOVANI I ZALECHIVANI RAZRUSHENII, VYZVANNOGO LAZERNYM LUCHOM, V MONOKRISTALLAKH FLORISTOGO LITIIA].

N. V. Volkova, V. A. Likhachev, V. M. Salmanov, and I. D. Iaroshetskii (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR).

Fizika Tverdogo Tela, vol. 8, Dec. 1966, p. 3595-3601, 8 refs. In Russian.

Experimental investigation of the nature and microstructure of the region damaged by a strong laser pulse in an LiF single crystal. The principal features of this region in the presence of a main crack in the cleavage plane (001) normal to the beam and of slip dislocations along the [101], [101], [011], and [011] directions, which leads to an extended field of residual stresses. The kinetics of the formation and subsequent healing of the damage centers are studied, and an explanation for the observed shape of the healed crack is proposed. V. P.

**A67-17096**

EPITAXIAL INDIUM ARSENIDE LASERS.

M. A. C. S. Brown and P. Porteous (Ministry of Aviation, Royal Radar Establishment, Great Malvern, Worcs., England).

Solid-State Electronics, vol. 10, Jan. 1967, p. 76, 77. 5 refs.

Brief description of the technique of InAs diode laser fabrication using liquid phase epitaxy, giving results obtained from such lasers. The apparatus for liquid epitaxy is basically as described by Nelson (1963). A plot of quantum efficiency vs laser length gives an internal quantum efficiency of about 4% at 77°K, which is typically a factor of 20 less than in GaAs - presumably due mainly to defects in the InAs crystals. D. H.

**A67-17097**

POPULATION INVERSION IN HETEROJUNCTION STRUCTURES.

W. B. Berry (Notre Dame, University, Notre Dame, Ind.).

Solid-State Electronics, vol. 10, Jan. 1967, p. 79, 80.

Discussion of the change in the basic barrier relation for the heterojunction when compared to the homojunction of a wide-gap emitter injection laser. The basic condition is that the applied potential must raise the energy of the injected electrons by an amount greater than the energy of the emitted photon. Under the assumption that the entire applied voltage exists across the junction - i.e., the  $iR$  and space charge voltages in the bulk regions are negligible, the built-in barrier represents a natural upper limit on the applied voltage. B. B.

**A67-17168 #**

BEGINNING OF THE OVERLAP OF THE OPERATING RANGES OF LASERS AND BACKWARD-WAVE TUBES.

M. B. Golant, V. S. Savell'ev, Z. S. Korotkova, Z. T. Alekseenko, and M. I. Ermakova.

(Radiotekhnika i Elektronika, vol. 11, July 1966, p. 1321, 1322.)

Radio Engineering and Electronic Physics, vol. 11, July 1966, p. 1153. Translation.

[For abstract see issue 20, page 3580, Accession no. A66-38004]

**A67-17232**

NONLINEAR PROPERTIES OF THE LASER AS AN AMPLIFIER.

T. M. Il'inova and R. V. Khokhlov (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR).

(Radiofizika, vol. 8, no. 5, 1965, p. 899-908.)

Soviet Radiophysics, vol. 8, Sept.-Oct. 1965, p. 639-645. 9 refs. Translation.

[For abstract see issue 02, page 241, Accession no. A66-11841]

**A67-17233**

PERIODICALLY MODULATED EMISSION AND THE POSSIBILITY OF GENERATING "GIANT" PULSES IN A THREE-LEVEL LASER USING A NONUNIFORMLY EXCITED ACTIVE MEDIUM.

V. I. Bepalov and E. I. Iakubovich (Gor'kovskii Gosudarstvennyi Universitet, Nauchno-Issledovatel'skii Radiofizicheskii Institut, Gorki, USSR).

(Radiofizika, vol. 8, no. 5, 1965, p. 909-919.)

Soviet Radiophysics, vol. 8, Sept.-Oct. 1965, p. 646-653.

Translation.

[For abstract see issue 02, page 241, Accession no. A66-11842]

**A67-17234**

MASER OSCILLATOR WITH SINUSOIDAL FIELD DISTRIBUTION. IV.

V. B. Tsaregradskii (Gor'kovskii Gosudarstvennyi Universitet, Gorki, USSR).

(Radiofizika, vol. 8, no. 5, 1965, p. 920-923.)

Soviet Radiophysics, vol. 8, Sept.-Oct. 1965, p. 654-656. 5 refs. Translation.

[For abstract see issue 02, page 241, Accession no. A66-11843]

**A67-17272 \*\***

SPATIALLY RESOLVED LASER HETERODYNE MEASUREMENTS OF PLASMA DENSITIES IN WEAKLY IONIZED GASES.

J. T. Verdeyen, B. E. Cherrington, and M. E. Fein (Illinois, University, Dept. of Electrical Engineering, Urbana, Ill.).

Applied Physics Letters, vol. 9, Nov. 15, 1966, p. 360-362.

7 refs.

Research supported by the Zenith Radio Corp. and NASA.

A two-wavelength He-Ne laser heterodyne system has been successfully used to measure electron number densities in the range from  $4 \times 10^{12} \text{ cm}^{-3}$  to  $10^{11} \text{ cm}^{-3}$ , over a path length of 24 cm. These experiments were performed on a single-shot basis in pulsed argon discharges. The spatially resolved laser measurements compared quite favorably with integrated electron density measurements made with a microwave cavity operating in the  $TM_{010}$  mode.

(Author)

**A67-17274 #**

AN INVESTIGATION OF THE EFFECT OF GAS ADDITIVES ON THE ELECTRON TEMPERATURE AND DENSITY IN A  $CO_2$  LASER DISCHARGE.

P. O. Clark and M. R. Smith (Hughes Aircraft Co., Research Laboratories, Malibu, Calif.).

Applied Physics Letters, vol. 9, Nov. 15, 1966, p. 367-369.

9 refs.

The radial variation of electron temperature and density with partial gas pressures in a  $\text{CO}_2\text{-N}_2\text{-He}$  laser discharge is measured using double-probe and microwave resonance techniques. In a 22-mm-diam discharge tube the optimum partial gas pressures for maximum laser power correspond to an electron temperature of 3 eV and a density of  $3 \times 10^{19}/\text{cm}^3$ . The radial electron density profile is compatible with measured gain profiles. The results indicate that the role of He in the excitation mechanism is not due to a reduction in electron temperature. (Author)

**A67-17280**

FERMI CONTROLLED RECOMBINATION AS A JUNCTION DESIGN FACTOR IN GaAs LASER DIODES.  
N. N. Winogradoff and H. K. Kessler (National Bureau of Standards, Electron Devices Section, Washington, D.C.).  
*International Journal of Electronics, First Series*, vol. 21, Oct. 1966, p. 329-335. 15 refs.

Confirmation of the observation that deliberate introduction of shallow donors in the p-type side of GaAs lasers results in greatly improved efficiency in radiative recombination. Earlier field-effect experiments indicated that this enhancement is due to a critical separation of the intrinsic and actual Fermi levels in the space charge region, rather than to donor-acceptor transitions. A qualitative model, consistent with experimental observations, is described. It is used in the design of improved lasers yielding total peak power outputs above 23 watts at room temperature. B.B.

**A67-17322**

HOLOGRAPHIC STUDY OF THE SECOND HARMONIC OF THE WAVE EMITTED BY A RUBY LASER [ETUDE HOLOGRAPHIQUE DU SECOND HARMONIQUE DE L'ONDE EMISE PAR UN LASER A RUBIS].  
Claude Froehly (Besançon, Université, Laboratoire d'Optique, Besançon, France).  
*Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques*, vol. 263, no. 23, Dec. 7, 1966, p. 1304-1307. In French.

Method of recording, by holography, the second harmonic wave emitted by a KDP crystal excited by the  $R_1$  line of a ruby laser. The holograms obtained make possible the tridimensional reconstruction of this wave, the figure of diffraction of which, at infinity, shows itself in the form of a flattened volume of small dimensions. The influence of defects of spatial coherence of the wave studied is examined. F.R.L.

**A67-17326**

HELIUM-NEON LASER OSCILLATOR WITH COUPLED RESONATORS [EIN HELIUM-NEON-LASER-OSZILLATOR MIT GEKOPPELTEN RESONATOREN].  
Rudolf Hecken (Aachen, Technische Hochschule, Institut für Hochfrequenztechnik, Aachen, West Germany).  
*Archiv der elektrischen Übertragung*, vol. 20, Dec. 1966, p. 672-682. 23 refs. In German.

Development of a method for suppressing undesirable axial modes in a gas laser oscillating at several frequencies. Two Fabry-Pérot-type resonator cavities of different length are regeneratively amplified by filling them with an active medium. The theory indicates a pronounced suppression of the oscillations in the case of low losses and high gain of the shorter resonator cavity. An experimental verification of the theory is described. V.P.

**A67-17327**

LASER MIRROR FOR DECOUPLING A SPECIAL DIFFRACTION-LIMITED PARALLEL BEAM [LASERSPIEGEL ZUR AUSKOPPLUNG EINES SPEZIELLEN BEUGUNGSBEGRENZTEN PARALLEL-STRAHLS].  
Gerhard K. Grau (Siemens AG, Forschungslaboratorium, Munich, West Germany).  
*Archiv der elektrischen Übertragung*, vol. 20, Dec. 1966, p. 704, 705. In German.

Discussion of the principles of designing a laser mirror in the form of a lens, such that the beam emitted by the laser forms a beam "waist" at a constant distance from the mirror, irrespective of the curvature and spacing of the other mirror and, thus, of the distance between the beam "waist" within the resonator cavity and the decoupling mirror. The design proposed is based on two theorems concerning the behavior and imaging of Gaussian beams. V.P.

**A67-17371 #**

MEASUREMENTS OF CONCENTRATION PROFILES IN JETS USING FIZEAU FRINGES.

A. Frohn (Cornell University, Graduate School of Aerospace Engineering, Ithaca, N.Y.).  
*AIAA Journal*, vol. 5, Jan. 1967, p. 185-187. 7 refs.  
Navy-supported research.

Use of Fizeau fringes produced in a Fabry-Pérot interferometer to obtain concentration profiles in inhomogeneous turbulent and laminar jets. If the interferometer is illuminated with parallel monochromatic light, the incident light is transmitted only if the interference condition  $N \cdot \lambda = 2 \cdot d$  is fulfilled,  $N$  being an integer,  $\lambda$  the wavelength of the incident light, and  $d$  the distance between the plates. A laser interferometer is described which is a useful instrument in fluid dynamics if small changes in the refractive index have to be measured. F.R.L.

**A67-17383 #**

THE FEASIBILITY OF LASER EXPERIMENTS FOR MEASURING ATMOSPHERIC TURBULENCE PARAMETERS.

John W. Strohbehn (Dartmouth College, Thayer School of Engineering, Radiophysics Laboratory, Hanover, N.H.).  
*Journal of Geophysical Research*, vol. 71, Dec. 15, 1966, p. 5793-5808. 12 refs.  
NSF Grant No. GP-3705.

Investigation of the feasibility of several line-of-sight propagation experiments using lasers in studying atmospheric turbulence. The investigation showed the theoretical possibility of finding the permittivity spectrum,  $\Phi(K)$  or its associated correlation function from measurements of the correlation function of amplitude, phase, or angle of arrival over parallel line-of-sight paths. Although the phase variations are relatively insensitive to variations in the assumed permittivity spectrum, the angle-of-arrival and amplitude measurements are more sensitive and hence would be more suitable for attempting to determine  $\Phi(K)$  experimentally. M.M.

**A67-17447**

FARADAY ROTATION MEASUREMENT OF TRAPPED MAGNETIC FIELDS IN A THETAPINCH PLASMA.

P. Bogen and D. Rusbüldt (EURATOM and Nordrhein-Westfalen, Kernforschungsanlage Jülich, Institut für Plasmaphysik, Jülich, West Germany).  
*Physics of Fluids*, vol. 9, Nov. 1966, p. 2296-2298. 9 refs.

Using a 3.39- $\mu$  He-Ne laser, trapped fields of -4 to +8 kgauss were measured in a 45-kgauss driving field ( $\beta > 0.97$ ) when no bias field was applied. With antiparallel bias field, no trapped field reversal was observed at high densities. (Author)

**A67-17525**

A TVR LASER OSCILLATOR USING A SINGLE POCKELS CELL FOR Q-SWITCHING AND SYNCHRONIZED CAVITY DUMPING.  
W. R. Hook, R. P. Hilberg, and R. H. Dishington (TRW, Inc., TRW Systems Group, Redondo Beach, Calif.).

*IEEE, Proceedings*, vol. 54, Dec. 1966, p. 1954, 1955.

Description of the successful operation of a fully synchronized neodymium-glass laser Time Variable Reflection (TVR) oscillator employing a single Pockels cell to accomplish both Q-switching and cavity dumping. The operation of the unique drive circuit which accomplishes the synchronizing function is also described. M.F.

## A67-17548

### A67-17548

HEATING OF A TWO-LAYER PLATE IN LASER-BEAM WELDING. N. N. Rykalin, A. A. Uglov, and N. I. Makarov (Akademiia Nauk SSSR, Institut Metallurgii, Moscow, USSR). (Akademiia Nauk SSSR, Doklady, vol. 169, July 21, 1966, p. 565-568.)

Soviet Physics - Doklady, vol. 11, Jan. 1967, p. 632-634. Translation.

[For abstract see issue 22, page 3923, Accession no. A66-40194]

### A67-17569

SOME RECENT RESEARCH ON COHERENCE AND FLUCTUATIONS OF LIGHT.

Emil Wolf (Rochester, University, Dept. of Physics and Astronomy, Rochester, N.Y.).

(Commission Internationale d'Optique, Congrès sur les Progrès Récents en Optique Physique, Paris, France, May 2-7, 1966, Paper.) Optica Acta, vol. 13, Oct. 1966, p. 281-298. 36 refs.

USAF-Army-supported research.

Review of various investigations on coherence and fluctuations of light carried out within the last few years. In particular some of the research carried out at the University of Rochester and related investigations undertaken elsewhere are described. This research is mainly concerned with the following topics: classical and quantum description of higher order coherence effects, photon correlation and coincidence experiments, stellar correlation interferometry, photon bunching, and the determination of the statistical properties of light from photoelectric counting experiments.

(Author)

### A67-17574

INTERFERENCE AND COHERENCE [INTERFERENCES ET COHERENCE].

M. Françon (Paris, Université, Institut d'Optique, Paris, France). Optica Acta, vol. 13, Oct. 1966, p. 371-374. In French.

Study of the degree of coherence of two points illuminated by a plane quasi-monochromatic source. Two cases are examined - one in which the two points are situated in a plane parallel to that of the source and another in which the two points are situated on a plane normal to the source.

F.R.L.

### A67-17591

APPLICATION OF LASERS TO THE STUDY OF THE HIGH ATMOSPHERE AND OF OBJECTS BEYOND THE ATMOSPHERE [LES APPLICATIONS DES LASERS A L'ETUDE DE LA HAUTE ATMOSPHERE ET DES OBJETS EXTRA-ATMOSPHERIQUES].

A. Orszag (Ecole Polytechnique, Laboratoire de Physique, Paris, France).

(Comité National Français de Radioélectricité Scientifique, Feb. 4, 1966, Conférence.)

L'Onde Electrique, vol. 46, Nov. 1966, p. 1260-1270. In French.

Study of the use of lasers for geodetic measurements by satellite. The laser makes it possible to operate on radar system working at optical wavelengths. It is then practical to measure with high precision the distance between various ground stations or between those and an artificial satellite in order to arrive at geodesic triangulations or the measurement of orbits. Similarly, by means of a more powerful installation, the distance between the earth and the moon can be measured. Finally, the examination of the light emerging from a laser and diffused in the atmosphere can lead to an exact and rapid measurement of the density and temperature at various altitudes.

M.F.

### A67-17620 #

COMPETITION BETWEEN TWO TYPES OF OSCILLATION IN A TRAVELING WAVE LASER (TWL).

S. G. Zeiger and E. E. Fradkin.

(Optika i Spektroskopiia, vol. 21, Sept. 1966, p. 386-390.)

Optics and Spectroscopy, vol. 21, Sept. 1966, p. 217-219. 6 refs. Translation.

[For abstract see issue 01, page 89, Accession no. A67-10362]

### A67-17635

DEEP-SPACE OPTICAL COMMUNICATIONS.

E. Brookner, M. Kolker (Raytheon Co., Sudbury, Mass.), and R. M. Wilmette.

(NTC/66; PROCEEDINGS OF THE 1966 NATIONAL TELEMETERING CONFERENCE, BOSTON, MASS., MAY 10-12, 1966, p. 36-41.)

IEEE Spectrum, vol. 4, Jan. 1967, p. 75-82. 8 refs.

[For abstract see issue 19, page 3300, Accession no. A66-35666]

### A67-17636

THEORETICAL STUDY OF A FOUR-WAVE INTERFEROMETRIC DEVICE [ETUDE THEORIQUE D'UN MONTAGE INTERFEROMETRIQUE A QUATRE ONDES].

Josette Vincent-Geisse and Evelyne Cohen de Lara-Benzaquen (Laboratoire de Recherches Physiques, Département Infrarouge, Paris, France).

Annales de Physique, vol. 1, Sept.-Oct. 1966, p. 543-546. In French.

Observation that if the light from a two-modes emitting laser is directed toward the entrance of a Michelson interferometer, the addition of two groups of two coherent waves is obtained. Under these conditions, calculation shows that, as the length of one of the optical paths of the interferometer is gradually increased, interferences of variable contrasts are to be observed, such as the minima increase from zero to coincide with the maxima. One possible application of this calculation consists in a simultaneous determination of phase and group velocities of the radiation emitted in the medium considered.

M.F.

### A67-17723

INELASTIC LIGHT SCATTERING FROM LANDAU-LEVEL ELECTRONS IN SEMICONDUCTORS.

R. E. Slusher, C. K. N. Patel, and P. A. Fleury (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

Physical Review Letters, vol. 18, Jan. 16, 1967, p. 77-80. 12 refs.

Inelastic scattering of 10.6- $\mu$  CO<sub>2</sub> laser radiation by mobile electrons in a magnetic field has been observed in n-InSb. Spectra of the scattered light reveal three distinct lines corresponding to electron spin flip and to transitions with  $\Delta l = 1$  and  $\Delta l = 2$ , where  $l$  is the Landau-level quantum number. Observations are compared with theoretical predictions and electronic parameters obtainable from the spectra are discussed.

(Author)

### A67-17754

OBSERVATION OF GENERATION AT THE SUM FREQUENCY IN ELECTRO-OPTIC NONLINEAR CRYSTALS.

Iu. A. Gol'din, V. G. Dmitriev, V. K. Tarasov, and N. V. Shkunov. (ZHETF Pis'ma v Redaktsiiu, vol. 4, Dec. 1, 1966, p. 441-445.)

JETP Letters, vol. 4, Dec. 1, 1966, p. 297-299. 17 refs. Translation.

Results of experiments aimed at observing the generation of the sum frequency of two lasers, ruby ( $\lambda = 0.6943 \mu$ ) and Nd<sup>3+</sup> glass ( $\lambda = 1.058 \mu$ ); the sum frequency falls in this case in the blue-violet band ( $\lambda = 0.4192 \mu$ ). The frequencies are added in a nonlinear electro-optic KDP crystal cut in the synchronism direction (for interactions of the type  $k_1^0 + k_2^0 = k_3^0$  and  $k_1^0 + k_2^0 = k_3^0$ , where  $k_1$  is the ruby-laser wave vector, the calculated synchronism angles in KDP are 43°21' and 57°10' respectively; interactions of the type  $k_1^e + k_2^0 = k_3^e$  are not allowed by the dispersion characteristics of the KDP crystal). The lasers operated in the Q-switched mode.

F.R.L.

### A67-17756

SELF MODULATION OF EMISSION FROM AN INJECTION SEMICONDUCTOR LASER.

V. D. Kurnosov, V. I. Magalias, A. A. Pleshkov, L. A. Rivlin, V. G. Trukhan, and V. V. Tsvetkov.  
(ZHETF Pis'ma v Redaktsiiu, vol. 4, Dec. 1, 1966, p. 449-453.)  
JETP Letters, vol. 4, Dec. 1, 1966, p. 303-305. 5 refs. Translation.

Experimental observation of the time structure of the GaAs laser emission with the aid of an electron-optical converter with a time-scanned image and with sweep duration  $\sim 2$  nsec on a 35-mm screen, at a resolution not inferior to 0.02 nsec. Photographs of the time-scanned image of the glowing active layer which clearly show the emission self-modulation (spikes) are included. A decrease in the self-modulation period with increasing injection current was also noticed.

F. R. L.

**A67-17757**

## USE OF ARTIFICIAL METEORS FOR LASER PUMPING.

G. A. Askar'ian, E. Ia. Gol'ts, and M. S. Rabinovich (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).  
(ZHETF Pis'ma v Redaktsiiu, vol. 4, Dec. 1, 1966, p. 453-456.)  
JETP Letters, vol. 4, Dec. 1, 1966, p. 305-307. Translation.

Discussion of possibilities of using artificial meteors or rapidly moving objects fired from guns to pump medium-power lasers. When a body moves at high speed in a gas, intense gas glow is produced in the compression wave. The energy lost by the body is determined by the deceleration force. At high velocities the compression of the gas ahead of the nose of the bullet heats the gas in the shock wave strongly, and an appreciable fraction of bullet energy can go into the radiation. The method can be used to construct compact pump systems for laboratory lasers without resorting to capacitor banks.

F. R. L.

**A67-17792**OPTICAL CONSIDERATIONS FOR VIEWING LASER OPERATIONS.  
R. W. Dyer (Western Electric Co., Inc., Engineering Research Center, Princeton, N.J.).

(Society of Photo-Optical Instrumentation Engineers, Technical Symposium, 11th, St. Louis, Mo., Aug. 22-26, 1966, Paper.)  
SPIE Journal, vol. 5, Oct.-Nov. 1966, p. 13-17, 39. 11 refs.

Description of the optical design considerations in the development of the first known use of the laser in a production shop. One problem is to provide a suitable viewing system, unless the application is simple enough to allow automatic control. For safe operation in the laboratory, viewing instruments should contain interlocked opaque shutters or carefully designed filters. It is believed that closed-circuit TV offers many advantages over other methods.

S. Z.

**A67-17822 #**

## LUMINESCENCE OF CuCl AT LOW TEMPERATURES EXCITED BY VERY HIGH INTENSITY LIGHT (LASER).

J. B. Grun, R. Lévy, A. Mysyrowicz, and S. Nikitine (Strasbourg, Université, Institut de Physique, Laboratoire de Spectroscopie et d'Optique du Corps Solide, Strasbourg, France).  
Physics Letters, vol. 24A, Jan. 2, 1967, p. 50-52. 10 refs.

The luminescence of CuCl excited by double photon absorption (laser) is compared to single photon excitation with conventional and high intensity light. The spectra obtained are different in every case. Repetitive laser shots modify permanently the emission spectrum of CuCl.

(Author)

**A67-17823 #**

## THE EFFECT OF SATURATION ON THE POLARIZATION PARAMETERS OF MODES IN ANISOTROPIC GAS LASERS.

W. Van Haeringen (Philips' Gloeilampenfabrieken, Philips Research Laboratories, Eindhoven, Netherlands).

Physics Letters, vol. 24A, Jan. 2, 1967, p. 65, 66. 5 refs.

Investigation of the nonlinear medium-induced anisotropic effect on the orientation of the polarization ellipse of a mode in a gas laser. An observed polarization flip with hysteresis is theoretically explained.

M. M.

**A67-17824 #**

## STATISTICAL PROPERTIES OF COHERENT LIGHT SCATTERED BY A PLASMA.

B. Crosignani and P. Di Porto (Fondazione Università Bordini, Istituto Superiore P. T., Rome, Italy).

Physics Letters, vol. 24A, Jan. 2, 1967, p. 69, 70. 7 refs.

Research supported by the Consiglio Nazionale delle Ricerche.

A method for measuring the correlation functions of a plasma through the statistics of scattered or transmitted light is proposed. The case of second and fourth-order correlation functions is considered.

(Author)

**A67-17876**

## INVESTIGATION OF THE LENGTH AND SHAPE OF A GIANT PULSE AS A FUNCTION OF THE POPULATION INVERSION COEFFICIENT.

V. I. Malyshev and A. S. Markin (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 50, June 1966, p. 1458-1463.)

Soviet Physics - JETP, vol. 23, Dec. 1966, p. 968-972. 8 refs. Translation.

[For abstract see issue 20, page 3577, Accession no. A66-37367]

**A67-17887**

## LASER DISPLAYS.

Henry R. Senf (Hughes Aircraft Co., Research Laboratories, Malibu, Calif.).

(Society of Motion Picture and Television Engineers, Semiannual Technical Conference and Equipment Exhibit, 100th, Los Angeles, Calif., Oct. 2-7, 1966, Paper.)

SMPTE, Journal, vol. 76, Jan. 1967, p. 4-8. 6 refs.

Contract No. AF 30(602)-4097.

Definition of the potential advantages of lasers for displays. The technical problems requiring solutions before practical laser displays are feasible are discussed. Performance objectives of some current research and development studies are outlined. Potential uses for laser displays include the projection on a large screen of data which can be displayed in symbolic or line-drawing form, projection for the theater, and projection for home use. A laser display can offer increased total usable light output for the instantaneous display of dynamic data. The status of existing devices and techniques for generating, intensity-modulating and deflecting high-power visible laser beams is described.

M. M.

**A67-17888**

## INTRA-CAVITY COLOR SELECTION IN ION LASERS.

G. P. Wen, J. M. Hammer (Radio Corporation of America, RCA Laboratories, Princeton, N.J.), I. Gorog, F. W. Spong, and J. A. Van Raalte (Radio Corporation of America, RCA Laboratories, Systems Research Laboratory, Display Devices Group, Princeton, N.J.).

IEEE Journal of Quantum Electronics, vol. QE-2, Nov. 1966, p. 711-713. 5 refs.

Discussion of techniques for preparing various types of internal laser color switches with the aid of the electro-optic effect. Experiments in which it proved possible to switch the primary colored (red, green, blue) lasing lines of a  $Kr^+$  laser are considered.

M. F.

**A67-17889**

## ELECTROLUMINESCENCE AND SEMICONDUCTOR LASERS.

Henry F. Ivey.

(Institute of Electrical and Electronics Engineers, Symposium on Electroluminescence and Semiconductor Lasers, Stevens Institute of Technology, Hoboken, N.J., May 11, 1966, Paper.)

IEEE Journal of Quantum Electronics, vol. QE-2, Nov. 1966, p. 713-726. 215 refs.



## A67-17890

The various types of electroluminescence are discussed, with particular reference to the luminescence efficiency, and the materials in which electroluminescence has been observed are listed. Semiconductor lasers operating with electroluminescent, cathodoluminescent, or photoluminescent excitation, and some of the pertinent materials and operating parameters are reviewed. All known semiconductor lasers are listed. Such devices are useful for a variety of applications, particularly if emission in the infrared region and operation at low temperatures is feasible. On the other hand, highly efficient visible electroluminescence or coherent emission has not been observed from any semiconductor at room temperature to date. (Author)

## A67-17890

### LASER BIBLIOGRAPHY. IV.

K. Tomiyasu (General Electric Co., Schenectady, N. Y.).  
IEEE Journal of Quantum Electronics, vol. QE-2, Nov. 1966, p. 726-755.

Laser bibliography covering the period from January through June 1966. Subjects discussed include ruby laser, neodymium laser, He-Ne gas laser, other gas lasers, laser resonators and mode considerations, Raman and Brillouin scattering, transmission, propagation, scattering, reflection, and filtering, and holography and wavefront reconstruction. M. F.

## A67-17891

### HETERODYNE DETECTION AND LINEWIDTH MEASUREMENT WITH HIGH POWER CO<sub>2</sub> LASERS.

R. A. Brandewie, R. H. Harada (North American Aviation, Inc., Autonetics Div., Anaheim, Calif.), and W. T. Haswell, III (North American Aviation, Inc., Autonetics Div., Anaheim, Calif.; Carnegie Institute of Technology, Pittsburgh, Pa.).  
IEEE Journal of Quantum Electronics, vol. QE-2, Nov. 1966, p. 756, 757. 5 refs.

Study of the heterodyne detection of beats between two CO<sub>2</sub> lasers. An upper limit for the CO<sub>2</sub> laser linewidth and estimates of short and long-term stability are obtained. A copper-doped germanium photoconductor, cooled almost to liquid-He temperature, was used as a heterodyne detector. Heterodyne frequencies as high as 58 MHz may be generated by length-tuning one of the lasers; detection of this difference frequency verifies the high-frequency response of Cu:Ge. The CO<sub>2</sub> laser linewidth was found to be less than 710 Hz, with consequent short-term stability of about four parts in 10<sup>10</sup>. Drift rates of 100 kHz range were observed. All results were obtained with the lasers operating at 45 and 5 watts, respectively. M. F.

## A67-17892

### INTRINSIC NOISE TEMPERATURE OF THE REFLECTION MASER. H. Rothe and K. Rupf (Karlsruhe, Technische Hochschule, Institut für Hochfrequenztechnik und Hochfrequenzphysik, Karlsruhe, West Germany).

IEEE Journal of Quantum Electronics, vol. QE-2, Nov. 1966, p. 757, 758.

Description of an experimental setup for determining the intrinsic noise temperature of a reflection-type cavity maser. It consists of the maser-resonator and circulator followed by a circulator-isolator. M. F.

## A67-17965

### GAS-LASER FREQUENCY STABILIZATION.

Alan D. White (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

Microwaves, vol. 6, Jan. 1967, p. 51, 52, 54-56, 58, 60, 61. 14 refs.

Application of four automatic frequency control (AFC) systems to the frequency control of an He-Ne laser. The systems use the laser-atomic-line discriminator, the passive-cavity discriminator, the Zeeman-cell discriminator, and a passive-cavity, Zeeman-cell combination system. The discriminator types are discussed in detail. M. F.

## A67-18072 #

### PROGRESS IN RADIO ELECTRONICS.

Roy W. Gould, A. E. Siegman, and J. R. Whinnery.

(International Scientific Radio Union, Commission 7, General Assembly, 15th, Munich, West Germany, Sept. 5-15, 1966, United States National Committee Report.)

Radio Science, vol. 1, Dec. 1966, p. 1379-1388. 183 refs.

Topical review and listing of the various recent scientific papers (dated 1963-1966) in the field of radio electronics. The papers are classified in the following categories: progress in quantum electronics (microwave masers and frequency standards; basic laser theory; gas lasers; solid-state lasers; stimulated Raman and Brillouin lasers; semiconductor lasers; optical parametric oscillators; optical modes and waveguides; modulation and detection; and laser application); progress in microwaves (microwave devices, microwave interaction in solids, low-noise microwave amplifiers, and high-power microwave tubes); scientific achievements in plasma physics (electromagnetic wave propagation and scattering in plasmas, longitudinal electrostatic waves in plasmas, beam-plasma interaction and discharges, cyclotron resonance echoes, kinetic theory of plasmas and radiation, terrestrial plasmas, plasma problems relating to thermonuclear power, and solid-state plasmas). S. Z.

## A67-18148

### EFFECTS OF SATURABLE ABSORBER LIFETIME ON THE PERFORMANCE OF GIANT-PULSE LASERS.

L. E. Erickson and A. Szabo (National Research Council, Radio and Electrical Engineering Div., Ottawa, Canada).

Journal of Applied Physics, vol. 37, Dec. 1966, p. 4953-4961. 36 refs.

Extension of an earlier paper on the theory of saturable absorber giant-pulse lasers by considering the effects of a finite absorber lifetime  $t_s$  on the pulse parameters. Digital-computer studies show that for typical systems the giant-pulse energy and peak power are practically unchanged from the case for which  $t_s \rightarrow \infty$ . A new result is that the initial cavity photon density or, alternately, the pump power, must exceed a threshold value to proceed from the region of initial normal lasing to giant pulsing. The role of the pump in the pulse buildup from noise is examined, in particular the transition region between the low-level behavior described by Sooy and the onset of absorber saturation. The ratio of photon density in the transition region to the peak density is shown to provide a measure of the product of the ratio of absorber-to-laser cross section times the absorber lifetime. Some possible mechanisms which lead either to mode selection or mode locking in passive Q-switched lasers are discussed. (Author)

## A67-18149

### PLASMA FORMED BY A LASER PULSE ON A TUNGSTEN TARGET.

A. W. Ehler (Hughes Aircraft Co., Research Laboratories, Malibu, Calif.).

Journal of Applied Physics, vol. 37, Dec. 1966, p. 4962-4966. 22 refs.

Results of an experimental study of the plasma produced by the interaction of the focused light from a Q-switched laser with a tungsten target in a vacuum. The plasma radius, temperature, and radiative properties were measured during the period of the laser pulse. In addition, the target mass loss and plasma velocity and impulse were observed. Based on these experimental results, a model was developed which provides an energy and power balance for the expanding, radiating plasma. (Author)

## A67-18150

### ELECTRONIC BEAM SCANNING OF INJECTION LASERS.

G. E. Fenner (General Electric Co., Research and Development Center, Schenectady, N. Y.).

Journal of Applied Physics, vol. 37, Dec. 1966, p. 4991-4994. 5 refs.

Account of experiments that resulted in the spatial scanning of the coherent emission of a GaAs junction laser at 77°K. By electrically separating the p side of the junction into several sections the current distribution is deliberately made nonuniform. Necessary

conditions for the continuous shifting of the beam across the width of the diode are given. Several geometries, satisfying these conditions, are considered and evaluated with respect to simplicity of experimental verification. It was found possible actually to scan the beam continuously across the entire width of the diode (about 1/2 mm) by employing two fixed, pulsed, current sources and only one variable resistor. Nonhomogeneities in emission intensity are related to the presence of "spots" reported since the early measurements in GaAs lasers. It is shown that these "spots" are determined by material parameters in the vicinity of the junction itself rather than by local conditions which might be caused by the current distribution.

(Author)

**A67-18168 #**

GAS LASER IN A MAGNETIC FIELD [GAZOVYI LAZER V MAGNITNOM POLE].

M. I. Diakonov and S. A. Fridrikhov (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut; Leningradskii Politekhicheskii Institut, Leningrad, USSR).  
Uspekhi Fizicheskikh Nauk, vol. 90, Dec. 1966, p. 565-600. 89 refs. In Russian.

Description of the main features of the behavior of a gas laser in a magnetic field and systematization of the available data on this question. The basic theories concerning a gas laser in a magnetic field are outlined. Such problems as the effect of a magnetic field on the laser intensity, beats in the magnetic field, and polarization effects are considered, as well as the use of the Zeeman effect for wideband frequency modulation of a gas laser and the problem of frequency stabilization of a single-mode gas laser with the aid of a magnetic field. The effect of a magnetic field on high-frequency pumping and direct-current pumping is discussed, and a study is made of electron cyclotron resonance in a gas-discharge laser (microwave pumping).

A. B. K.

**A67-18234**

TREATMENT OF STEEL WITH LASER RAYS.

A. N. Kokora, A. A. Zhukov, V. A. Shalashov, E. N. Liumarov, M. P. Kallanova, and V. A. Belianin (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Legkogo i Tekstil'nogo Mashinostroeniia, Moscow, USSR).

(Metallovedenie i Termicheskaiia Obrabotka Metallov, Feb. 1966, p. 41, 42.)

Metal Science and Heat Treatment, Jan.-Feb. 1966, p. 132-134. Translation.

[For abstract see issue 12, page 1888, Accession no. A66-24898]

**A67-18394**

BALL-JOINT FOR THE ADJUSTMENT AND FIXING OF MIRRORS AND WINDOWS OF A GAS LASER.

V. P. Zaitsev (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

(Pribory i Tekhnika Eksperimenta, vol. 11, May-June 1966, p. 214, 215.)

Instruments and Experimental Techniques, Jan. 1967, p. 736, 737. Translation.

[For abstract see issue 20, page 3578, Accession no. A66-37523]

**A67-18511 \* #**

THE ANALYSIS OF TURBULENCE FROM DATA OBTAINED WITH A LASER VELOCIMETER.

N. E. Welch (NASA, Marshall Space Flight Center, Huntsville, Ala.) and W. J. Tomme (Brown Engineering Co., Inc., Huntsville, Ala.).

American Institute of Aeronautics and Astronautics, Aerospace Centres Meeting, 5th, New York, N.Y., Jan. 23-26, 1967, Paper 67-179, 11 p.

Members, \$0.75; nonmembers, \$1.50.

The investigation concerned the use of a laser velocimeter to determine point velocities in a turbulent liquid flowing in a pipe. The velocity distribution was determined at each point and for each

rate of bulk flow. This method of measurement affords data unaffected by any protuberance in the flow stream. The frequency response of the base instrument and electronics is sufficient to measure all frequencies of turbulence investigated. The data were verified by comparing the mean velocity profile calculated from the probability distribution function with profiles determined by other methods of mean velocity measurement. The variance of the distribution function was verified with turbulent diffusion data. The velocity distribution function as derived from statistical reasoning was found to properly describe the measured axial velocity components. The change in the variance of the velocity distribution function is derived and is compared with the measured variance.

(Author)

**A67-18542**

POLARIZATION CHARACTERISTICS OF AN IONIZED-GAS LASER IN A MAGNETIC FIELD.

Douglas C. Sinclair (Rochester, University, Institute of Optics, Rochester, N.Y.).

(Optical Society of America, Annual Meeting, San Francisco, Calif., Oct. 19-22, 1966, Paper.)

Optical Society of America, Journal, vol. 56, Dec. 1966, p. 1727-1731. 8 refs.

Army-supported research.

Study of the polarization characteristics of an ionized-argon laser in a magnetic field. It is found that the application of a magnetic field to a laser employing internal mirrors causes the light to break up into a set of right and left circularly polarized modes, while in a Brewster-window laser the magnetic field causes the light to become elliptically polarized and causes the axes of the ellipse to rotate. A detailed investigation is made of the state of polarization of the light in the latter case. It is found that the ellipticity of the light is small and that the losses introduced by Brewster windows are also small. The results of experimental measurements are found to be in general agreement with a theory which takes gain saturation in the laser into account.

A. B. K.

**A67-18545**

INTERPRETATION OF OSCILLATION LINES IN Ar-Br<sub>2</sub> LASER.

L. N. Tunitskii and E. M. Cherkasov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

Optical Society of America, Journal, vol. 56, Dec. 1966, p. 1783, 1784. 7 refs.

Comparative study of optical-maser action observed at four wavelengths in the Ar-Br<sub>2</sub> and the Ar-O<sub>2</sub> lasers. Evidence is presented showing that the four lines in the Ar-Br<sub>2</sub> laser are caused by oxygen impurity in the discharge tube and must be attributed to the oxygen triplet at 8446 Å and not to Br I.

A. B. K.

**A67-18712**

GENERATION OF U.V. RADIATION FROM A Nd-GLASS LASER BY FREQUENCY MULTIPLICATION IN ADP.

D. A. Channing, D. E. Killick, and D. A. Bateman (Ministry of Aviation, Royal Aircraft Establishment, Farnborough, Hants., England).

Infrared Physics, vol. 6, Dec. 1966, p. 159, 160. 7 refs.

Radiation at 0.265 μ has been produced from the output at 1.06 μ of a Nd-laser by frequency-doubling successively in two ADP crystals. With a plane polarized 6-Mw pulse at 1.06 μ, 1 Mw at 0.53 μ was generated, and 35 kw at 0.265 μ.

(Author)

**A67-18758 #**

RESONATOR Q MODULATION OF GAS LASERS WITH AN EXTERNAL MOVING MIRROR.

Th. H. Peek, P. T. Bolwijn, and C. Th. J. Alkemade (Utrecht, Rijksuniversiteit, Fysisch Laboratorium, Utrecht, Netherlands).  
Physics Letters, vol. 24A, Jan. 16, 1967, p. 128-130. 15 refs.

The predicted central tuning dip in the modulated power output of gas lasers was observed by applying resonator Q modulation. The modulation was obtained by means of an external moving mirror. The signal shapes observed are explained for the quasi-static case.

(Author)

**A67-18759 #**

DEPENDENCE OF NON-CLASSICAL ELECTRON EMISSION FROM METALS ON THE DIRECTION OF POLARISATION OF LASER BEAMS.

Gy. Farkas, Zs. Nárá, and P. Varga (Central Research Institute for Physics, Budapest, Hungary).

*Physics Letters*, vol. 24A, Jan. 16, 1967, p. 134, 135. 10 refs.

Description of electron emission experiments on silver irradiated by a high-power laser beam, performed under conditions with negligible Richardson effect. Electron emission is observed which depends on the direction of polarization relative to the surface. The effect may be attributed to multiphoton processes. (Author)

**A67-18778**

MEASURING LENGTH REMOTELY AND ACCURATELY WITH A LASER BEAM.

W. J. Coleman (Battelle Memorial Institute, Pacific Northwest Laboratory, Optical Laboratory, Richland, Wash.).

(Instrument Society of America, Annual Conference, 21st, New York, N.Y., Oct. 24-27, 1966, Paper.)

*Instrumentation Technology*, vol. 14, Jan. 1967, p. 45-48.

AEC Contract No. AT (45-1)-1830.

Description of a laser extensometer developed to measure accurately (maximum error 0.0002 in.) small dimensional changes of a specimen in a tensile testing furnace at approximately 3500°F. Elements of the system include a 6328-Å gas laser (Spectra Physics Model 115), a rotating mirror and a system of lenses, a pair of flags on the specimen, a type 6199 phototube, and a timer consisting of two counters. Resolution, calibration, precision-limiting factors, and the effect of component movement are considered. D. H.

**A67-18782 #**

STUDY OF A LASER BASED ON NEODYMIUM-ACTIVATED GLASS WITH EXTERNAL FEEDBACK [ISSLEDOVANIE OPTICHESKOGO KVANTOVOGO GENERATORA NA STEKLE AKTIVIROVANNOM NEODIMOM S VNESHNEI OBRATNOI SVYAZ'YU].

A. M. Bonch-Bruевич, V. Iu. Petrun'kin, V. N. Arzumanov, N. A. Esepkina, Ia. A. Imas, S. V. Kruzhalov, L. N. Pakhomov, and V. A. Chernov.

*Zhurnal Tekhnicheskoi Fiziki*, vol. 36, Dec. 1966, p. 2171-2174. In Russian.

Results of an experimental study of the time characteristics and spectral changes of a neodymium glass laser during its conversion to a traveling wave laser. It is shown that its emission spectrum approaches a line spectrum in the process and that the emission beam alternation becomes more ordered. V. Z.

**A67-18783 #**

INVESTIGATION OF A NEODYMIUM GLASS LASER WITH A SPHERICAL MIRROR RESONATOR [ISSLEDOVANIE OKG NA NEODIMOVOM STEKLE S REZONATOROM IZ SFERICHESKIKH ZERKAL].

A. M. Bonch-Bruевич, N. A. Esepkina, Ia. A. Imas, N. A. Pavlenko, L. N. Pakhomov, V. Iu. Petrun'kin, and S. E. Potapov.

*Zhurnal Tekhnicheskoi Fiziki*, vol. 36, Dec. 1966, p. 2175-2180.

7 refs. In Russian.

Discussion of the stationary regime of a neodymium glass laser with a resonator composed of spherical mirrors. The effect of the distance between resonator mirrors is investigated and the condition is given for maximum beam brightness. The properties of the laser pulses obtained are described. V. Z.

**A67-18784 #**

SOME PECULIARITIES IN He-Ne LASER PERFORMANCE IN THE PULSED REGIME [O NEKOTORYKH OSOBENNOSTIYKH RABOTY He-Ne LAZERA V IMPUL'SNOM REZHIME].

T. M. Perchanok, V. M. Russov, and S. A. Fridrikhov (Leningradskii Politekhnikeskii Institut, Leningrad, USSR).

*Zhurnal Tekhnicheskoi Fiziki*, vol. 36, Dec. 1966, p. 2188-2190. 9 refs. In Russian.

Experimental study of the constant pressure dependence of the output power of an He-Ne laser on the amplitude of periodic high-voltage excitation pulses given in fast sequences of 2000 pulses/sec. Observations with the aid of an electron-optical converter of the intensity distribution across the laser beam cross section indicate complex multimode structures arising during the operation of an He-Ne laser in the pulsed regime. V. Z.

**A67-18787 #**

ACCELERATION OF AN OSCILLATOR BY LASER EMISSION [USKORENIE OSTSILLIATORA IZLUCHENIEM LAZERA].

V. B. Krasovitskii and V. I. Kurilko.

*Zhurnal Tekhnicheskoi Fiziki*, vol. 36, Dec. 1966, p. 2210-2212. 6 refs. In Russian.

Discussion of the problem of motion of a charge in a constant homogeneous magnetic field under the action of laser emission in the form of plane waves superimposed on random phases. It is shown that the increase in particle energy is proportional to the energy density of all emission harmonics. V. Z.

**A67-18788 #**

TEMPERATURE DEPENDENCE OF THE THRESHOLD CURRENT IN INJECTION LASERS AND THEIR CONTINUOUS OPERATION UNDER LIQUID NITROGEN COOLING [TEMPERATURNALAZAVISIMOST' POROGOVOGO TOKA INZHEKTSIONNYKH KVANTOVYKH GENERATOROV I NEPRERYVNOY REZHIM RABOTY PRI OKHLAZHDENIY ZHIDKIM AZOTOM].

P. G. Eliseev, I. Ismailov, A. I. Krasil'nikov, M. A. Man'ko, and V. P. Strakhov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*Zhurnal Tekhnicheskoi Fiziki*, vol. 36, Dec. 1966, p. 2213-2215. 16 refs. In Russian.

Results of temperature dependence measurements at temperatures from 77 to 200°K for the threshold current of diodes prepared by diffusion and epitaxial techniques. Epitaxial diodes are found to be superior in terms of continuity of generation. V. Z.

**A67-18789 #**

USE OF A SEMICONDUCTOR MIRROR FOR Q-FACTOR MODULATION OF A LASER RESONATOR [ISPOL'ZOVANIE POLUPROVODNIKOVOGO ZERKALA DLIYA MODULATSII DOBROTNOSTI REZONATORA OKG].

P. G. Eliseev and M. A. Man'ko (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*Zhurnal Tekhnicheskoi Fiziki*, vol. 36, Dec. 1966, p. 2215, 2216. In Russian.

Results of an experimental study of semiconductor mirrors as means for the creation of a modulated Q-factor regime in laser resonators. The laser used a 9 x 120-mm ruby rod and a resonator formed by one of its end faces and an additional mirror. Giant pulses were obtained when a Ge or InSb mirror was substituted for interferential metallized mirrors or polished glass surfaces which emit regular free radiation. The practical value of some specific variations of the modulated generation regime obtained is discussed. V. Z.

**A67-18796 #**

MULTIPHOTON IONIZATION OF ATOMS. II [MNOGOFOTONNAIA IONIZATSIIYA ATOMOV. II].

G. S. Voronov, G. A. Delone, and N. B. Delone (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

*Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, vol. 51, Dec. 1966, p. 1660-1664. 10 refs. In Russian.

Experimental study of the multiphoton ionization of a krypton atom ( $J = 13.996$  eV) by ruby laser radiation ( $h\nu = 1.785$  eV). The phenomenon was established when the photon flux intensity was  $\approx 10^{31} \text{ cm}^{-2} \text{ sec}^{-1}$  which corresponded to a field of  $\sim 3 \times 10^7$  v/cm. Experimental measurements of the ionization probability and its dependence on the photon flux intensity are described. The ionization probability is found to be roughly proportional to the power  $K \approx [J/(h\nu + 1)] - 2$  of the photon flux. An analysis of theoretical

and experimental results indicates a substantial contribution of bonded-state electron transfers to the ionization probability and a substantial effect of the radiation field on these bonded states. V. Z.

#### A67-18797 #

DYNAMICS OF RADIATION SPECTRUM NARROWING IN A LASER WITH NONRESONANCE FEEDBACK [DINAMIKA SUZHENIYA SPEKTRA IZLUCHENIYA KVANTOVOGO GENERATORA S NEREZO-NANSNOI OBRATNOI SVIAZ'IU].

R. V. Ambartsumian, P. G. Kriukov, and V. S. Letokhov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR). Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 51, Dec. 1966, p. 1669-1675. 10 refs. In Russian.

Theoretical and experimental study of the dynamics of the narrowing effect of surface (MgO layer, dull white paper) and spatial (sulfur hydrolol, smoke aerosol) dispersing agents on the radiation line of a ruby laser with nonresonance feedback. Line narrowing in a nonresonance-feedback laser is found to be a much slower process than in a resonance-feedback laser. V. Z.

#### A67-18798 #

THEORY OF SEMICONDUCTOR OPTICAL EXCITATION - ABSORPTION AND DISPERSION IN ONE-PHOTON AND TWO-PHOTON PROCESSES [K TEORII OPTICHESKOGO VOZBUZHDENIYA POLUPROVODNIKOV - POGLOSHCHENIE I DISPERSIYA PRI ODNOFOTON-NYKH I DVUKH FOTONNYKH PROTSYSSAKH].

Iu. L. Klimontovich and E. V. Pogorelova (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, vol. 51, Dec. 1966, p. 1722-1733. 14 refs. In Russian.

Calculation of interband electron absorption and dispersion during one-photon and two-photon processes in semiconductors under the action of a strong electromagnetic field, taking into account electron deceleration in the semiconductor bands. It is shown that the absorption band edge shifts toward the higher frequencies when  $\hbar\omega_1$  is greater than the forbidden zone width in a one-photon process or is greater than half the forbidden zone width in a two-photon process. The frequency range within which absorption processes are negative is defined. It is also shown that the dispersion curve maximum shifts toward the higher frequencies as the electromagnetic field increases. The results are applied to explain processes in semiconductor lasers with optical pumping. V. Z.

#### A67-18807 #

EXPERIMENTAL STUDY OF THE DISINTEGRATION OF AN INSTANTANEOUSLY HEATED SUBSTANCE AND OF THE RESULTING PULSE, FOR ENERGY CONCENTRATIONS LOWER THAN THE VAPORIZATION HEAT [EKSPERIMENTAL'NOE ISSLEDOVANIE RAZLETA MGNOVENNO NAGRETOGO VESHCHESTVA I VOZNIKAUSHCHEGO IMPUL'SA PRI KONTSENTRATSII AKH ENERGII, MEN'SHIKH TEPLoty ISPARENIIA].

A. A. Kalmykov, I. V. Nemchinov, and A. I. Petrukhin. PMTF - Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki, Nov.-Dec. 1966, p. 3-13. 12 refs. In Russian.

High-speed photographic study of the cleavage and separation of fragments for dye-doped ice and paraffin heated instantaneously by a giant ruby laser pulse. The mechanical pulse arising in the process is measured at energy concentrations below the vaporization heat energy. Pertinent formulas are derived, and the experimental technique is described. V. Z.

#### A67-18808 #

EFFECT OF A LASER LIGHT BEAM ON ORGANIC GLASS [DEISTVIE SVETOVOGO LUCHA LAZERA NA ORGANICHESKOE STEKLO].

A. I. Akimov, L. I. Mirkin, and N. F. Pilipetskii (Akademiia Nauk SSSR, Institut Problem Mekhaniki, Moskovskii Gosudarstvennyi Universitet, Nauchno-Issledovatel'skii Institut Mekhaniki, Moscow, USSR).

PMTF - Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki, Nov.-Dec. 1966, p. 14-18. 9 refs. In Russian.

Analysis of the optical effects produced by focusing a laser light beam into organic glass samples. Microcracks and macrocracks are established in samples exposed to  $10^{-3}$  to  $10^{-8}$ -sec pulses. Various types of damage in transparent polymers are noted. The effect of variations in focal length on the character and geometry of the damage is discussed. V. Z.

#### A67-18881 #

APPLICATION OF NANOSECOND LIGHT PULSES TO BALLISTIC RANGE MEASUREMENTS.

W. G. Clay, R. E. Slattery, A. P. Ferdinand, and C. R. Kilcline (Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.).

AIAA Journal, vol. 5, Feb. 1967, p. 364, 365.

Discussion of the advantages in free-flight hypersonic research of using pulse light sources (sparks and lasers) of high intensity and having pulse durations on the order 10 to 20 nsec. Motion blurring in photographs made with such light sources is at least an order of magnitude less than that obtained with longer duration sparks commonly in use. Photographs of this type give information about projectile integrity, position, and attitude as well as showing the effects of ablation on projectiles of many types. D. H.

#### A67-18930 #

SEMICONDUCTOR LASERS USING OPTICAL PUMPING.

N. G. Basov, A. Z. Grasiuk, V. F. Efimov, I. G. Zubarev, V. A. Katulin, and Iu. M. Popov (Akademiia Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

IN: INTERNATIONAL CONFERENCE ON THE PHYSICS OF SEMICONDUCTORS, KYOTO, JAPAN, SEPTEMBER 8-13, 1966, PROCEEDINGS. [A67-18901 06-26]

Conference sponsored by the International Union of Pure and Applied Physics, the Science Council of Japan, and the Ministry of Education. Tokyo, Physical Society of Japan (Physical Society of Japan, Journal, vol. 21, Supplement, 1966), 1966, p. 277-282; Discussion, B. Ancker-Johnson (Boeing Co., Scientific Research Laboratories, Seattle, Wash.), C. H. Gooch, and R. B. Watson, p. 282. 13 refs.

Results of experimental and theoretical studies of GaAs, CdTe, CdSe, and CdS semiconductor lasers, using single-photon and double-photon optical excitation. The nonresonant losses in the active medium and the depth of penetration of the exciting medium in the case of single-photon excitation are considered, as well as the laser efficiency and power. An analysis is made of the damage structure of polished GaAs surfaces exposed to high-intensity laser pulses. The probability of double-photon absorption is determined, and a formula for determining the coefficient of double-photon absorption is derived. A few remarks are made concerning semiconductor lasers with "radiating mirrors." A. B. K.

#### A67-18934 #

ON THE MECHANISM OF RECOMBINATION RADIATION OF P-N JUNCTIONS IN GaAs.

D. N. Nasledov and B. V. Tsarenkov (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR).

IN: INTERNATIONAL CONFERENCE ON THE PHYSICS OF SEMICONDUCTORS, KYOTO, JAPAN, SEPTEMBER 8-13, 1966, PROCEEDINGS. [A67-18901 06-26]

Conference sponsored by the International Union of Pure and Applied Physics, the Science Council of Japan, and the Ministry of Education. Tokyo, Physical Society of Japan (Physical Society of Japan, Journal, vol. 21, Supplement, 1966), 1966, p. 302-306.

Review of certain investigations of recombination radiation of p-n junctions in GaAs. An analysis is made of the kinetics of radiative recombination of nonequilibrium current carriers in GaAs p-n junctions. A comparative study is made of recombination radiation of GaAs p-n junctions with and without a Fabry-Perot cavity. The change in the current-voltage characteristic of a GaAs laser during the transition from radiation amplification to lasing is ascertained. A. B. K.

## A67-19011

### A67-19011

#### LASER PHOTOGRAPHY.

Barry Miller (Aviation Week and Space Technology, Los Angeles, Calif.).

(New York Academy of Sciences, Conference on Planetology and Space Mission Planning, New York, N.Y., Nov. 3, 4, 1965, Paper.) New York Academy of Sciences, Annals, vol. 140, Dec. 16, 1966, p. 190-195.

Description of a rudimentary laser camera line-scanning system for nighttime reconnaissance. A 20-mw CW He-Ne laser is used, giving the system a resolution of about 1 mrad. Laser line-scanners using CW lasers with outputs of some tens of watts may have applications for extraterrestrial photographic missions.

D.H.

### A67-19079

#### RCA LASER RESEARCH AND ENGINEERING.

Camden, N.J., Radio Corporation of America, 1966. 68 p.

#### CONTENTS:

LASERS AND RCA. Robert B. Janes (Radio Corporation of America, Somerville, N.J.), p. 2, 3. [See A67-19080 07-16]

P-N JUNCTIONS AS OPTICAL SOURCES. Michael F. Lamorte (Radio Corporation of America, Somerville, N.J.), p. 4-6. 22 refs. [See A67-19081 07-26]

LASER STUDIES AT RCA VICTOR RESEARCH LABORATORIES, MONTREAL - A REVIEW. Allan I. Carswell (RCA Victor Co., Ltd., Montreal, Canada), p. 7-17. 14 refs. [See A67-19082 07-16]

QUANTUM ELECTRONICS RESEARCH AT RCA LABORATORIES - AN INTRODUCTION. Henry R. Lewis (Radio Corporation of America, Princeton, N.J.), p. 18.

ARGON LASERS. Karl G. Hernqvist (Radio Corporation of America, Princeton, N.J.), p. 19-21. [See A67-19083 07-16]

Nd:Cr:YAG HIGH-EFFICIENCY HIGH-POWER SOLID-STATE LASER SYSTEM. Robert J. Pressley (Radio Corporation of America, Princeton, N.J.), p. 22-25. [See A67-19084 07-16]

SUPERSENSITIVE LASER LIGHT DETECTOR. Henry S. Sommers, Jr. and E. K. Gatchell (Radio Corporation of America, Princeton, N.J.), p. 26-29. [See A67-19085 07-16]

UNDERWATER LASER TRANSMISSION CHARACTERISTICS. Howard J. Okoomian (Radio Corporation of America, Burlington, Mass.), p. 30-34.

APPLICATION OF INJECTION LASERS TO COMMUNICATION AND RADAR SYSTEMS. William J. Hannan (Radio Corporation of America, Camden, N.J.), p. 35-39. [See A67-19086 07-16]

LASER SPECTROSCOPY. Hendrik J. Gerritsen (Radio Corporation of America, Princeton, N.J.), p. 40-43. 31 refs. [See A67-19087 07-16]

LASER DIGITAL DEVICES. Walter F. Kosonocky and Roy H. Cornely (Radio Corporation of America, Princeton, N.J.), p. 44-47. [See A67-19088 07-16]

THE SIGNIFICANCE OF THE LASER IN MEDICINE AND BIOLOGY. Leslie E. Flory (Radio Corporation of America, Princeton, N.J.), p. 48, 49.

LASER SAFETY CONSIDERATIONS. Paul Brown, Jr. (Radio Corporation of America, Princeton, N.J.), p. 50, 51. 19 refs. [See A67-19089 07-16]

DRILLING OF MICROSCOPIC HOLES IN METALS BY LASER BEAM. Burton R. Clay (Radio Corporation of America, Burlington, Mass.), p. 52-55. [See A67-19090 07-15]

METEOROLOGICAL LASER PROBING FROM SATELLITES. J. A. Cooney (Radio Corporation of America, Princeton, N.J.), p. 56-59. 5 refs. [See A67-19091 07-16]

LASERS AND HOLOGRAMS. Edward G. Ramberg (Radio Corporation of America, Princeton, N.J.), p. 60-66. 20 refs. [See A67-19092 07-14]

### A67-19080

#### LASERS AND RCA.

Robert B. Janes (Radio Corporation of America, RCA Electronic Components and Devices Div., Somerville, N.J.).

IN: RCA LASER RESEARCH AND ENGINEERING.

Camden, N.J., Radio Corporation of America, 1966, p. 2, 3.

Discussion of the role played by RCA in laser research, of where the company is likely to make use of lasers as a part of a system or in process control, and what it will manufacture. A few of the growing number of applications for lasers are described; nevertheless, it is quite possible that new uses which fit into the corporate pattern of business may soon outweigh any or all of the functions described.

M.M.

### A67-19082

#### LASER STUDIES AT RCA VICTOR RESEARCH LABORATORIES, MONTREAL - A REVIEW.

Allan I. Carswell (RCA Victor Co., Ltd., Research Laboratories, Optical and Microwave Physics Laboratory, Montreal, Canada).

IN: RCA LASER RESEARCH AND ENGINEERING.

Camden, N.J., Radio Corporation of America, 1966, p. 7-17. 14 refs. Research supported by the Canadian Defense Research Board.

Description of laser investigations undertaken in the fields of spectroscopy, interferometry, and plasma diagnostics. Recent work involving the use of lasers for altering the population distributions in gas discharges is also described. Results of several experiments on new, high-power carbon dioxide lasers constructed in the laboratory are given. These devices have been used to generate watts of CW power with high efficiencies in the IR and are of interest for several applications. Recent work on lithium-drifted silicon photodiodes for fast, high-sensitivity laser detectors is summarized.

M.M.

### A67-19083

#### ARGON LASERS.

Karl G. Hernqvist (Radio Corporation of America, RCA Laboratories, Princeton, N.J.).

IN: RCA LASER RESEARCH AND ENGINEERING.

Camden, N.J., Radio Corporation of America, 1966, p. 19-21.

Discussion of the advantages of using charged particles for lasing, from the standpoint of laser physics. The associated laser-tube-construction problems have recently been overcome, making it possible to manufacture reliable, long-life argon lasers. In spite of the low efficiencies presently attainable, several promising applications are being studied where the continuous-duty argon laser operating in the visible-wavelength region is used.

M.M.

### A67-19084

#### Nd:Cr:YAG HIGH-EFFICIENCY HIGH-POWER SOLID-STATE LASER SYSTEM.

Robert J. Pressley (Radio Corporation of America, RCA Laboratories, Princeton, N.J.).

IN: RCA LASER RESEARCH AND ENGINEERING.

Camden, N.J., Radio Corporation of America, 1966, p. 22-25.

Research supported by the Radio Corporation of America; Contract No. AF 33(615)-2645.

Systematic study of the parameters and characteristics of the system, following an initial success in demonstrating that the Nd<sup>3+</sup>:YAG laser could be improved by incorporating Cr<sup>3+</sup> as an energy transfer agent. The study led to an optically pumped laser system with an average output of 10 watts at 10,640 Å. The theoretical limits imposed on any optically pumped laser system are discussed, the experimental approach taken to optimize the Nd:Cr:YAG system is outlined, and the operating characteristics of a Nd:Cr:YAG system representing the current status of development are described.

M.M.

### A67-19086

#### APPLICATION OF INJECTION LASERS TO COMMUNICATION AND RADAR SYSTEMS.

William J. Hannan (Radio Corporation of America, Defense Electronic Products, Camden, N.J.).

IN: RCA LASER RESEARCH AND ENGINEERING.

Camden, N.J., Radio Corporation of America, 1966, p. 35-39.

Description of the application of the GaAs room-temperature laser diode to laser communication and radar systems. It is pointed out that, since this GaAs diode requires a threshold drive current

of only 10 amp, simple and reliable drive circuits can be used, while elimination of the need for refrigeration reduces power input, size, and weight. M.M.

#### A67-19087

##### LASER SPECTROSCOPY.

Hendrik J. Gerritsen (Radio Corporation of America, RCA Laboratories, Princeton, N.J.).

IN: RCA LASER RESEARCH AND ENGINEERING.

Camden, N.J., Radio Corporation of America, 1966, p. 40-43. 31 refs.

Brief review of some major areas of research and technology based on spectroscopy using lasers. The manner in which the monochromaticity of the laser allows very great precision in line shape and line position measurements is discussed. The high light intensity obtainable from lasers offers the possibility of detecting emission lines previously undetectable, and also gives rise to a large group of new phenomena in the field of nonlinear optics. M.M.

#### A67-19088

##### LASER DIGITAL DEVICES.

Walter F. Kosonocky and Roy H. Cornely (Radio Corporation of America, RCA Laboratories, Princeton, N.J.).

IN: RCA LASER RESEARCH AND ENGINEERING.

Camden, N.J., Radio Corporation of America, 1966, p. 44-47.

Research sponsored by the Radio Corporation of America; Contracts No. AF 30(602)-3169; No. AF 30(602)-3914.

Description of a program concerned with the possibility that laser components might form a new generation of switching circuits for digital computers. Only laser digital devices in which all of the processing signals are in the form of optical energy are described. These devices could be used as general-purpose logic circuits in the same way that transistors are presently used for this purpose, except that all of the processing would be done with optical rather than electrical signals. The operation of the laser digital devices is based on a signal gain derived from a laser amplifier and on nonlinear interaction of intense optical signals with laser materials. The two basic nonlinear processes are quenching of the output of a laser oscillator and saturation of optical absorption. M.M.

#### A67-19089

##### LASER SAFETY CONSIDERATIONS.

Paul Brown, Jr. (Radio Corporation of America, RCA Laboratories, Princeton, N.J.).

IN: RCA LASER RESEARCH AND ENGINEERING.

Camden, N.J., Radio Corporation of America, 1966, p. 50, 51. 19 refs.

Description of a safety program to provide adequate safeguards against the potential hazards of the laser. The program considers matters of sight hazards, since the radiance of a laser can exceed the level which the human eye can safely tolerate. It also considers other factors involving cases where focused or unfocused laser beams can produce burns on tissue or vaporize certain materials. M.M.

#### A67-19090

##### DRILLING OF MICROSCOPIC HOLES IN METALS BY LASER BEAM.

Burton R. Clay (Radio Corporation of America, Defense Electronic Products, Aerospace Systems Div., Burlington, Mass.).

IN: RCA LASER RESEARCH AND ENGINEERING.

Camden, N.J., Radio Corporation of America, 1966, p. 52-55.

Investigation of the feasibility of drilling microscopic holes in metal by using a beam of light from a laser. A series of experiments on different materials that can be so ablated determined the energy and power required to remove a given volume of target material. The character of the resulting hole was studied, including shape, precision of location, and the repeatability of shapes. M.M.

#### A67-19091

##### METEOROLOGICAL LASER PROBING FROM SATELLITES.

J. A. Cooney (Radio Corporation of America, Defense Electronic Products, Astro-Electronics Div., Princeton, N.J.).

IN: RCA LASER RESEARCH AND ENGINEERING.

Camden, N.J., Radio Corporation of America, 1966, p. 56-59. 5 refs.

Discussion of the potential usefulness of lasers for remote probing of the atmosphere for meteorological purposes because of the very high power per unit bandwidth available and because of the light-scattering properties of the atmosphere itself. Some giant pulsed laser systems are discussed which are available with powers of  $10^9$  watts in a 20- to 40-nsec pulse, beam half-angles of a few mrad, and bandwidths of a few angstroms. These laser characteristics, in conjunction with the light scattering properties of the atmosphere, provide a basis for remote measurement of pressure, temperature, and humidity. Initially, a simple system is envisioned. M.M.

#### A67-19092

##### LASERS AND HOLOGRAMS.

Edward G. Ramberg (Radio Corporation of America, RCA Laboratories, Princeton, N.J.).

IN: RCA LASER RESEARCH AND ENGINEERING.

Camden, N.J., Radio Corporation of America, 1966, p. 60-66. 20 refs.

Discussion of different types of holograms. A hologram has been described by Gabor as a record which "contains the total information for reconstructing an object, which can be two-dimensional or three-dimensional." More specifically, a hologram is a recording of a standing-wave pattern formed by temporally coherent light from an object to be reproduced and from a reference source. When light from an identical reference source is incident on the developed record, it gives rise to a diffracted wave identical in amplitude and phase distribution with the original wave from the object. Thus, with illumination from an appropriate reference beam, the object can either be photographed or viewed directly by looking through the hologram. M.M.

#### A67-19131 #

##### DESIGN OF LIQUID-HYDROGEN-COOLED RUBY MASER FOR THE

X BAND [ÜBER DEN AUFBAU EINES RUBIN-MASERS FÜR DAS X-BAND MIT FLÜSSIGEM WASSERSTOFF ALS KÜHLMITTEL].

K.-H. Gothe, H.-J. Fröhlich, and L. Martini (Deutsche Akademie der Wissenschaften, Heinrich-Hertz-Institut für Schwingungsfor-

schung, Berlin, East Germany).

Hochfrequenztechnik und Elektroakustik, vol. 75, Oct. 1966,

p. 163-167. 12 refs. In German.

Discussion of a resonator-type ruby maser which employs liquid hydrogen for cooling to produce high gain at relatively low pumping power. The gain characteristics of ruby crystals with various degrees of chromium-ion doping are examined. The dependence of the gain-bandwidth product on concentration is interpreted on the basis of the spin-lattice relaxation process and experimental values of the spin-lattice relaxation times obtained for ruby crystals at 20.3°K. Theoretical and experimental values of the noise behavior are compared. V.P.

#### A67-19142 #

##### GAS LASER AS A SOURCE OF ILLUMINATION [GAZOVYI LAZER V KACHESTVE ISTOCHNIKA OSVESHCHENNOSTI].

I. V. Obreimov (Akademiia Nauk SSSR, Institut Obshchei i Neorganicheskoi Khimii, Opticheskaiia Laboratoriia, Moscow, USSR).

Akademiia Nauk SSSR, Doklady, vol. 171, Dec. '21, 1966, p. 1305-1308. 9 refs. In Russian.

Description of several simple experiments which verify the results obtained by Goldfischer (1965) with respect to the questions of the origin of aventurine spots observed on a screen illuminated by a laser. It is found that the spots are caused by the screen and not by the laser beam or the observer's eye. S.Z.

**A67-19169 #**

**ACTION OF A POWERFUL LIGHT BEAM ON POLYPROPYLENE FILMS [VOZDEISTVIE MOSHCHNOGO SVETOVOGO PUCHKA NA PLENKI POLIPROPILENA].**

N. P. Novikov (Akademiia Nauk SSSR, Institut Problem Mekhaniki, Moscow, USSR).

*Mekhanika Polimerov*, no. 6, 1966, p. 817-822. 19 refs. In Russian.

Examination by optical microscopy of changes in the giant-molecule structure of polypropylene films under the action of powerful light beams. The formation of a fine spherulite structure is observed in films following melting and recrystallization after exposure to millisecond pulses of 0.5 to 2.0 joule from a laser. On the other hand, 2- $\mu$ sec pulses caused partial melting and vaporization of exposed film areas. V. Z.

**A67-19315 #**

**TRIGGERING THE DETONATION OF CONDENSED EXPLOSIVES BY LASER RADIATION [VOZBUZHDENIE DETONATSII KONDENSIROVANNYKH VV IZLUCHENIEM OPTICHESKOGO KVANTOVOGO GENERATORA].**

A. A. Brish, I. A. Galeev, B. N. Zaitsev, E. A. Sbitnev, and L. V. Tatarintsev.

*Fizika Goreniia i Vzryva*, no. 3, 1966, p. 132, 133. In Russian.

Brief note on a detonation produced in lead azide and pentaerythritol tetranitrate by laser radiation in the Q-factor modulation regime. A 0.1- $\mu$ sec laser pulse of 10 Mw with a beam 15 mm in diameter detonated a sample of lead azide at a surface power density of 0.08 Mw/mm<sup>2</sup>. A much higher surface power density, obtained by beam focusing, was required for pentaerythritol tetranitrate detonation. The experimental technique is described. V. Z.

**A67-19400**

**MULTILAYER INTERFERENCE FILTERS WITH NARROW STOP BANDS.**

Leo Young (Stanford Research Institute, Menlo Park, Calif.).

*Applied Optics*, vol. 6, Feb. 1967, p. 297-313. 32 refs. USAF-sponsored research.

Multilayer interference filters having various transmission characteristics are described and compared. The emphasis is on filters with narrow stop bands such as might be used to eliminate the hazard from a laser beam. Four types of filters are considered: (1) quarter-wave stacks of two dielectric materials having matching layers one-eighth wavelength thick; (2) quarter-wave stacks of two dielectric materials having all layers of the same optical thickness (including the end layers); (3) quarter-wave stacks wherein all layers are of the same optical thickness, but the refractive indices of the layers may all be different to achieve equal reflection ripples in the passband; and (4) multilayer stacks of two dielectric materials wherein each layer may be of a different optical thickness to achieve nearly equal reflection ripples in the passband. The new formulas presented give the bandwidths between nulls of all the various filters as well as the bandwidths between equal-ripple points of the equal-ripple filters. Explicit formulas are stated for the ripple envelopes of the first two filter types and for the ripple heights of equal-ripple filters of the third and fourth types. A first-order design procedure based on the theory of linear arrays is given and evaluated by working numerical examples; general design criteria are presented to establish the validity of the first-order theory. (Author)

**A67-19408**

**ANALYSIS OF TRANSLUCENT AND OPAQUE PHOTOCATHODES.**  
John R. Sizelove and John A. Love, III (USAF, Systems Command, Research and Technology Div., Avionics Laboratory, Wright-Patterson AFB, Ohio).

*Applied Optics*, vol. 6, Feb. 1967, p. 356, 357. 5 refs.

Correction of errors in an earlier paper by the same authors on multiple beam interference in opaque photocathodes. It is conceded that, although Deutscher's analysis is fitting for the S-17 "highly reflecting" opaque photocathode, it is not appropriate for the S-20 photocathode in which the emitting layer is a dielectric substance and in which there is no silvered mirror. B. B.

**A67-19419**

**HIGH ALTITUDE ATMOSPHERIC SCATTERING OF LIGHT FROM A LASER BEAM.**

G. S. Kent, B. R. Clemesha, and R. W. Wright (West Indies, University, Dept. of Physics, Kingston, Jamaica).

*Journal of Atmospheric and Terrestrial Physics*, vol. 29, Feb. 1967, p. 169-181. 20 refs.

Grant No. AF AFOSR 616-66.

Measurements of the amount of scattering produced by the atmosphere from an intense light-beam projected vertically from a ruby laser. These observations have been made in Kingston, Jamaica. They show that the scattering observed from heights up to 80 km may be interpreted principally in terms of Rayleigh scattering from atmospheric molecules. In addition, superimposed on this, an enhancement of the scattered signal between 15 and 30 km is observed, which is believed to be due to the concentration of aerosols in this height range. An account is given of the theory of the experiment and of the equipment used. The limitations of the method are discussed and a comparison is made of daytime and nighttime observations, showing the different problems which arise in these two cases. (Author)

**A67-19469**

**LASERS: LIGHT AMPLIFIERS AND OSCILLATORS [LASER: LIGHTVERSTÄRKER UND -OSZILLATOREN].**

Dieter Röss (Siemens AG, Laboratorium für die physikalischen Grundlagen der Nachrichtentechnik, Munich, West Germany).

Frankfurt am Main, Akademische Verlagsgesellschaft (Technisch-Physikalische Sammlung, Volume 4), 1966. 722 p. In German. \$24.50.

This book provides a systematically organized review of the field of lasers. After a brief historical introduction, the properties of light and the interactions between light and matter are summarized. Inversion procedures and typical laser materials used for inversion are discussed. The operational principles of laser amplifiers and nonresonant oscillators are described, together with effects leading to multimode oscillation. Optical resonators and first-order mode-selective effects are considered, and a detailed study is made of the natural modes of open optical resonators. Methods of enhancing mode selection of optical resonators are considered, as well as the problem of oscillator power and optimal decoupling. A study is made of transient emission behavior and transient phenomena in laser oscillators. Methods of generating giant-pulse lasers and controlled lasers are outlined, and a number of optical pumping systems are described. Various applications of lasers are discussed. A. B. K.

**A67-19490 #**

**OPTIMUM DESIGN OF ELLIPTICAL PUMPING CHAMBERS FOR SOLID LASERS.**

Kozo Kamiryo, Tetsuo Kano, and Hidenori Matsuzawa (Tohoku University, Research Institute of Electrical Communication, Sendai, Japan).

*Japanese Journal of Applied Physics*, vol. 5, Dec. 1966, p. 1217-1226. 12 refs.

Derivation of fundamental charts for designing optimum elliptical pumping chambers from numerical calculations which contain all the geometrical sizes of pumping lamps and laser rods and the reflectivity of walls. The coupling efficiency between the lamp and the laser rod is compared with that of cylindrical chambers. The lowest energy for laser action is about 85J in the present experiments with the elliptical chambers whose reflectivity is about 0.7. M. M.

**A67-19492 #**

**RATE-EQUATIONAL APPROACH TO GAS DISCHARGE MODULATION IN A He-Ne LASER.**

Kazuo Kawabe, Uichi Kubo, and Yoshio Inuishi (Osaka University, Faculty of Engineering, Osaka, Japan).

*Japanese Journal of Applied Physics*, vol. 5, Dec. 1966, p. 1254, 1255.

NHK-supported research.

Consideration of the modulation process of the discharge current in a He-Ne laser when a signal is applied to the grid of a series power tube in the discharge circuit, resulting in the decrease of the modulated laser output with increasing modulation frequency between 50 and 250 kc for  $6328 \text{ \AA}$ , and between several kc and 50 kc for  $1.15 \mu$ . Rate equations similar to those discussed in the authors' theory of laser enhancement are solved. M.M.

**A67-19505 =**  
TUNING OF GAS-LASER RESONATORS [JUSTÁŽ REZONÁTORŮ  
PLYNOVÝCH LASERŮ].

J. Kršek and B. Popela (Československá Akademie Věd, Ústav Přístrojové Techniky, Brno, Czechoslovakia).  
*Jemná Mechanika a Optika*, vol. 12, Jan. 1967, p. 1-4. In Czech.  
Derivation of relations for adjusting various types of laser resonators and ensuring proper resonator performance. General aspects of resonator tuning are examined. V.P.

**A67-19506 =**  
IMPULSE DISCHARGE TUBES FOR LASER EMPLOYING INDUSTRIAL GLASS [IMPULSNÍ VÝBOJKY PRO LASER Z ČS. TECHNICKÉHO SKLA].

G. Sklenář (Výzkumný Ústav pro Sdělovací Techniku, Prague, Czechoslovakia).  
*Jemná Mechanika a Optika*, vol. 12, Jan. 1967, p. 22-27. 11 refs. In Czech.

Discussion of some basic properties of xenon-filled discharge tubes, with particular reference to the peculiarities that should be taken into account in the design of laser discharge tubes. Promising materials employed in discharge tube design are examined. V.P.

**A67-19552**  
KERR CELLS FOR AMPLITUDE AND FREQUENCY MODULATION OF LASER BEAMS [KERRZELLEN ZUR AMPLITUDEN- UND FREQUENZMODULATION VON LASERSTRAHLEN].

K. Klemas and G. Seifert (Braunschweig, Technische Hochschule, Institut für Hochfrequenztechnik, Braunschweig, West Germany).  
*Frequenz*, vol. 21, Jan. 1967, p. 19-27. 32 refs. In German.  
Theoretical and experimental investigation of the properties of Kerr cells. The properties are compared to those of elements employing electro-optical effects in crystals. For a Kerr cell with two electrodes it proved possible to obtain light losses of less than 1.5% at  $0.63 \mu$ , a negligibly small distortion of the light beam, and an extinction ratio of  $10^{5.5}$  for an electro-optical shutter. With a four-electrode Kerr cell, it is proved possible to obtain a frequency shift of 60 Mc for a laser beam. V.P.

**A67-19559**  
UNUSUAL CRYSTAL-FIELD ENERGY LEVELS AND EFFICIENT LASER PROPERTIES OF  $\text{YVO}_4:\text{Nd}$ .

J. R. O'Connor (Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, Mass.).  
*Applied Physics Letters*, vol. 9, Dec. 1, 1966, p. 407-409. 11 refs.  
The spectral properties of Nd-doped  $\text{YVO}_4$ , grown from the melt, have been determined. In absorption the Stark split levels are reduced in comparison to other Nd-doped materials. The Nd ion appears to be in a cubic crystal field even though it substitutes for Y whose point symmetry is less than  $(42m)$ . The reduced Stark splitting, caused by an admixture of 4f and 5d wave functions, leads to efficient, low-threshold laser action. Transfer of energy from the lattice to Nd ions is also observed. (Author)

**A67-19560**  
RELATIVE INTENSITIES OF THE  $5s^2P_{3/2} - 4p^2D_{5/2}$  AND THE  $5s^4P_{5/2} - 4p^4D_{7/2}$  TRANSITIONS IN THE Ar II LASER.

H. Marantz, R. I. Rudko, and C. L. Tang (Cornell University, School of Electrical Engineering, Ithaca, N.Y.).  
*Applied Physics Letters*, vol. 9, Dec. 1, 1966, p. 409-411. 9 refs. ARPA-USAF-supported research.

Measurements of the relative contributions of the  $5s^2P_{3/2} - 4p^2D_{5/2}$  transition and the  $5s^4P_{5/2} - 4p^4D_{7/2}$  transition to the total spontaneous intensity of Ar II near  $410.9 \text{ \AA}$ . It was found that the ratio is about 1 to 11 under discharge conditions found in typical CW Ar II masers and that the measured separation between the transition frequencies in wave numbers is very close to  $0.5/\text{cm}$ . S.Z.

**A67-19565**

ETCHING INVESTIGATIONS WITH CALCIUM TUNGSTATE LASER CRYSTALS [ÄTZUNTERSUCHUNGEN AN CALCIUMWOLFRAMAT-LASER-KRISTALLEN].

J. Grabmaier and B. Chr. Watson (Siemens AG, Forschungslaboratorium, Munich, West Germany).  
*Zeitschrift für angewandte Physik*, vol. 22, no. 2, 1967, p. 82-86. 5 refs. In German.

Discussion of improved etching methods, by which it proved possible to visualize lattice dislocations and small-angle grain boundaries in Czochralski-grown calcium tungstate crystals, doped with neodymium for laser application. A study of the lattice defect arrangement indicates the suitability of the crystals for use with lasers and also provides guidelines for proper crystal growth conditions. V.P.

**A67-19599 #**

KASTLER PHOTON SET AND THE STATISTICAL PROPERTIES OF LASER EMISSION IN A MULTIMODE EXCITATION REGIME [FOTONNYI ANSAMBL' KASTLERA I STATISTICHESKIE SVOISTVA IZLUCHENIYA LAZERA V MNOMODOVOM REZHIME VOZBUZHDENIYA].

V. V. Karavaev.  
*Radiotekhnika i Elektronika*, vol. 12, Jan. 1967, p. 144-146. In Russian.

Criticism of certain formulas for the fluctuation in the number of particles in a single cell of a Kastler photon set. It is shown that neither the formula proposed by Kastler for this fluctuation nor the heuristic formula proposed by Hodara for the fluctuations in a sinusoidal set is valid for laser emission. Simple formulas are derived for the particle fluctuation in a set of independent stabilized modes of identical amplitude and in a two-mode Kastler set. A.B.K.

**A67-19601 #**

EFFECT OF AN AXIAL MAGNETIC FIELD ON THE POWER OUTPUT OF A NEON-HELIUM LASER OPERATING IN A REGIME OF SIMULTANEOUS GENERATION OF THE  $3.39\text{-}\mu$  AND  $0.6328\text{-}\mu$  LINES [VLIVANIE AKSIAL'NOGO MAGNITNOGO POLIA NA VYKHODNUIU MOSHCNOST' NEON-GELIEVOGO LAZERA, RABOTAIUSHCHEGO V REZHIME ODNOVREMENNOI GENERATSII LINII  $3.39 \text{ i } 0.6328 \text{ MK}$ ].

A. A. Kuznetsov, D. I. Mash, and N. V. Skuratova.  
*Radiotekhnika i Elektronika*, vol. 12, Jan. 1967, p. 150-153. In Russian.

Study of the variation in the power output of a neon-helium laser operating in a regime of generation of two competing spectral lines as a function of the field strength of an applied axial magnetic field. A study is made of the dependence of the power output of IR and visible emission from the  $0.6328\text{-}\mu$  line on the gas pressure in the gas-discharge tube and the dependence of the power output of both types of emission from the  $0.6328\text{-}$  and  $3.39\text{-}\mu$  lines on the coil current at various pressures. A.B.K.

**A67-19605**

TRAVELLING-WAVE 8MM MASER.

Y. De Coatpont and A. Robert (Compagnie Générale de Télégraphie sans Fil, Laboratoires, Département CEPCA, Orsay, Seine-et-Oise, France).  
*Electronics Letters*, vol. 3, Jan. 1967, p. 5.

A prototype iron-doped-rutile traveling-wave maser has been developed; this maser operates in the  $34\text{-}36 \text{ GHz}$  frequency range. Using a  $5 \text{ cm}$ -long  $900\text{-ppm}$ -concentration crystal, typical gains of  $20 \text{ db}$  are obtained with a bandwidth of  $50 \text{ MHz}$  at  $1.7^\circ\text{K}$ . The noise temperature (without second-stage contribution) is less than  $45^\circ\text{K}$ . (Author)



**A67-19606**

## DISTANCE MEASUREMENT BY LASER.

Q. V. Davis (Surrey, University, London, England).

Electronics Letters, vol. 3, Jan. 1967, p. 11.

Observation that the distance between two points can be found by comparison of the phases of the modulation on a transmitted laser beam and its reflected beam. A result is presented pertaining to the error which can arise if multiple propagation exists. The result is relevant where a cooperative target cannot be used. M.F.

**A67-19676**

## TEMPERATURE DEPENDENCE OF THE CHARACTERISTICS OF THE CROSS RELAXATION RUTILE MASER.

Risao Hayashi.

Radio Research Laboratories, Review, vol. 12, Mar. 1966, p. 103-110. 6 refs. In Japanese.

Study of shifts of paramagnetic resonance spectra by temperature change, observed in a  $\text{TiO}_2$  crystal doped with  $\text{Cr}^{3+}$ . The inversion ratio is examined as the function angle for a cross-relaxation maser with different temperatures. The temperature dependence of pumping power and the desirable orientation are also discussed. F.R.L.

**A67-19734**

## OBSERVATION OF THE GENERATION OF SUM RADIATION FREQUENCY BY RUBY AND NEODYMIUM LASERS IN A KDP CRYSTAL [NABLIUDENIE GENERATSII SUMMARNOI CHASTOTY IZLUCHENII RUBINOVOGO I NEODIMOVOGO LAZEROV NA KRISTALLE KDP].

A. E. Savkin, A. S. Lugina, and B. V. Bokut' (Akademiia Nauk Belorusskoi SSR, Institut Fiziki, Minsk, Belorussian SSR).

Akademiia Nauk BSSR, Doklady, vol. 10, Dec. 1966, p. 933-935. In Russian.

Discussion of experiments designed to generate a sum frequency ( $\lambda = 4189 \text{ \AA}$ ) by the interaction in a KDP crystal of a conventional-wave ruby laser beam ( $\lambda_R = 6943 \text{ \AA}$ ) and a nonconventional-wave neodymium laser beam ( $\lambda_{Nd} = 10600 \text{ \AA}$ ) in the direction of phase coherence. A block diagram and brief description of the device used in the experiments are given. S.Z.

**A67-19789**

## GAS-LENS TYPE DEFLECTION STRUCTURE FOR LIGHT BEAMS.

F. J. Tischer (North Carolina, University, North Carolina State,

Dept. of Electrical Engineering, Raleigh, N.C.).

IEEE, Proceedings, vol. 55, Jan. 1967, p. 83, 84. 6 refs.

Description of a method for deflecting a light beam with low losses. The method is based on the effects of thermal gradients in gases. The structure investigated consists of two metal blocks with intermeshed sawtooth surfaces. M.M.

**A67-19794**

## OPTICAL POWER INCREASE IN GaAs LASER DIODES COATED WITH REFLECTING ALUMINUM SILICONE MIXTURE.

H. K. Kessler (National Bureau of Standards, Electron Devices Section, Washington, D.C.).

IEEE, Proceedings, vol. 55, Jan. 1967, p. 99, 100.

Description of evaporated coatings of aluminum or silver over silicon dioxide which have been used extensively as a reflective coating for GaAs lasers to increase the light output from the front face. These evaporated metal and insulator coatings require very sophisticated application techniques. The insulating layer of  $\text{SiO}_2$  often breaks down and shorts the laser diode. These and other disadvantages are overcome by covering all sides except the front face of the laser diode with a thick aluminum paint made from aluminum metal powder and a silicone lacquer, approximately 80 to 20 by volume. M.M.

**A67-19798**

## FAR-FIELD PATTERN OF ELECTRON-BOMBARDED SEMICONDUCTOR LASERS.

F. H. Nicoll (Radio Corporation of America, RCA Laboratories, Princeton, N.J.).

IEEE, Proceedings, vol. 55, Jan. 1967, p. 114, 115.

A sheet-like laser beam is observed from electron-bombarded CdS and ZnO single crystals. The far-field pattern extends  $360^\circ$  in azimuth and 5 to  $10^\circ$  perpendicular to this plane. The emission is in a plane perpendicular to the c axis of the crystal and is a result of total internal reflection from four sides of the crystal cavity. (Author)

**A67-19800**

## RESONANCE-LIKE CHARACTERISTICS OF THE DIRECT MODULATION OF A JUNCTION LASER.

Tetsuhiko Ikegami and Yasuharu Suematsu (Tokyo Institute of Technology, Dept. of Electronics Engineering, Tokyo, Japan).

IEEE, Proceedings, vol. 55, Jan. 1967, p. 122, 123.

Analysis of the characteristics of direct modulation of a junction laser with a bias current, based on the rate equations. It is found that the relative modulation efficiency, which is proportional to the ratio of modulated output light power to the modulating current, shows a resonance-like phenomenon where it becomes the maximum value at the resonance frequency. S.Z.

**A67-20093**

## TRAVELING WAVE EXCITATION OF HIGH POWER GAS LASERS.

John D. Shipman, Jr. (U.S. Naval Research Laboratory, Plasma Physics Div., Washington, D.C.).

Applied Physics Letters, vol. 10, Jan. 1, 1967, p. 3, 4. 8 refs. ARPA-sponsored research.

Experiments are described in which nitrogen and neon lasers are excited by a wave of current excitation which effectively travels from one end of the laser to the other with its velocity matching that of the stimulated emission. This type of excitation is accomplished with a low-impedance flat-plate Blumlein pulse generator. The power output in the direction of the wave of excitation is at least ten times that in the other direction. A 2.5-Mw pulse of about 4-nsec duration is obtained with nitrogen and a 190-kw pulse of about 1.5 nsec with neon. (Author)

**A67-20094**

## WAVE INTERACTIONS IN SATURABLE ABSORBERS.

S. E. Schwarz and T. Y. Tan (California, University, Dept. of Electrical Engineering and Electronics Research Laboratory, Berkeley, Calif.).

Applied Physics Letters, vol. 10, Jan. 1, 1967, p. 4-7. 7 refs. Grant No. AF AFOSR 139-66.

The interaction between waves in an idealized saturable absorber is discussed. It is shown that the presence of a strong wave will cause the line to appear to be "hole-burned" when probed by a second wave, even though the broadening mechanisms are conventionally homogeneous. This effect would be expected to work against the tendency of dye-switched ruby lasers to operate in a single mode. Related effects should play a role in optical pulse generators and in other devices using saturable absorbers. (Author)

**A67-20095**

## SPIKING AND TIME BEHAVIOR OF A PULSED WATER-VAPOR LASER.

W. Q. Jeffers and P. D. Coleman (Illinois, University, Dept. of Electrical Engineering, Electro-Physics Laboratory, Urbana, Ill.).

Applied Physics Letters, vol. 10, Jan. 1, 1967, p. 7-9. 6 refs. USAF-supported research.

Outline of experimental data on the time behavior of a pulsed water-vapor laser. Most of the far-IR emission lines from the laser showed rapid spiking, and significantly different time delays between the start of the current pulse excitation and the onset of laser oscillation. B.B.

**A67-20097****MEASUREMENT OF PICOSECOND LASER PULSE WIDTHS.**

J. A. Armstrong (International Business Machines Corp., Thomas J. Watson Research Center, Yorktown Heights, N.Y.).

Applied Physics Letters, vol. 10, Jan. 1, 1967, p. 16-18. 5 refs.

The special symmetry properties of second-harmonic generation at the surface of a GaAs crystal are used in a technique which measures the shape of the fast pulses from a mode-locked Nd-glass laser. The pulses studied were found to have a full width at half power of between 4 and 6 psec. The technique is capable of measuring pulse widths at least as short as  $4 \times 10^{-13}$  sec. (Author)

**A67-20115****MASERS FOR A RADIO ASTRONOMY INTERFEROMETER.**

F. W. Smith, P. L. Booth, and E. L. Hentley (Mullard, Ltd., Mullard Research Laboratories, Salfords, Surrey, England).

Philips Technical Review, vol. 27, no. 12, 1966, p. 313-321.

9 refs.

Research sponsored by the British Ministry of Defence.

Description of two traveling wave masers for a radio-astronomy interferometer. In order to obtain a very high receiver sensitivity, an extremely low noise temperature is required and a maser is therefore used for the first stage of each receiver. High stability is obtained by using a superconducting magnet to create the magnetic field which tunes the ruby maser crystal to the signal and pump frequencies. B.B.

**A67-20125****PHOTON-COUNTING DISTRIBUTIONS OF MODULATED LASER BEAMS.**

S. Fray, F. A. Johnson, R. Jones, T. P. McLean, and E. R. Pike (Ministry of Aviation, Royal Radar Establishment, Great Malvern, Worcs., England).

Physical Review, 2nd Series, vol. 153, Jan. 10, 1967, p. 357-359.

5 refs.

Description of the first explicit experimental verification of Mandel's formula relating the photon-counting distribution of a radiation field to its intensity fluctuations. This was accomplished by measuring the counting distributions obtained from a He-Ne gas-laser beam with superimposed square- and sine-wave modulations of various depths and frequencies. M.M.

**A67-20126****STRONG-FIELD SATURATION EFFECTS IN LASER MEDIA.**

Donald H. Close (California Institute of Technology, Div. of Engineering and Applied Science, Pasadena; Hughes Aircraft Co., Research Laboratories, Malibu, Calif.).

Physical Review, 2nd Series, vol. 153, Jan. 10, 1967, p. 360-371. 26 refs.

Analysis, using Lamb's model of the effects of gain saturation by strong traveling-wave fields in dilute laser media. Using approximate solutions of an integral equation for the population inversion density (PID), the index of refraction and incremental gain are studied for arbitrarily strong fields. Effects of atomic motion are included for a Maxwellian velocity distribution, but pressure effects are neglected. The case of a monochromatic field leads to the saturation results of Gordon, White, and Rigden, which are studied as a function of frequency. For a small ratio of natural to Doppler line widths, there is a transition from inhomogeneous to homogeneous broadening for sufficiently strong fields. An effect of particular interest is the generation of waves at  $2\omega_1 - \omega_2$ ,  $2\omega_2 - \omega_1$ , and higher order sidebands by two strong input signals at  $\omega_1$  and  $\omega_2$ . The source of the parametric gain at these frequencies is the time-dependent gain saturation due to the presence of multiple strong fields. For  $\omega_1 - \omega_2$  small compared to the decay rates  $\gamma_a$  and  $\gamma_b$  of the laser levels, the gain at these intermodulation sidebands is computed as a function of the field strengths. The limiting cases of homogeneous and inhomogeneous (due to atomic motion) broadening are studied in detail. These two cases give essentially the same results, for a given unsaturated gain. Numerical results indicate that a first-order sideband intensity at least 10% as large as that of

the inducing fields can be easily observed in practice. The integral equation for the PID is converted into an infinite set of linear algebraic equations for a typical solid-state laser. The conditions under which this set of equations can be limited to a finite number are discussed, and the dependence of the sideband gain on  $\omega_1 - \omega_2$  is calculated. For large  $\omega_1 - \omega_2$ , the gain at the m-th sideband decreases as  $(\omega_1 - \omega_2)^{-m}$ . (Author)

**A67-20147****MODE-LOCKING AND MODE-COMPETITION BY SATURABLE ABSORBERS IN A RUBY-LASER.**

A. Schmackpfeffer and H. Weber (Berlin, Technische Universität, I. Physikalisches Institut, Berlin, West Germany).

Physics Letters, vol. 24A, Jan. 30, 1967, p. 190, 191.

Achievement in a ruby laser of mode-locking and mode-competition using an RG-8 filter as a passive modulator. A reproducible relation between the filter position within the cavity and number of completed modes was investigated by analyzing the laser output in time and frequency with high resolution. B.B.

**A67-20183****LASER EMISSION IN ELECTRON-BEAM EXCITED ZnSe.**

O. V. Bogdankevich, M. M. Zverev, A. I. Krasilnikov, and A. N. Pechenov (Akademii Nauk SSSR, Fizicheskii Institut, Moscow, USSR).

Physica Status Solidi, vol. 19, no. 1, 1967, p. K5, K6.

Description of laser action in ZnSe crystals at 4600 Å. The ZnSe crystals were prepared under high pressure in a closed container by gas-phase reaction and following crystallization. It was found that, at small current densities, a red light emission of extrinsic nature occurs. At current densities greater than several amp/cm<sup>2</sup>, a blue line appears at 4570 Å. A further increase of the current density causes a sharp rise of the line intensity, the simultaneous reduction of the linewidth from 70 to 11 Å, as well as a directional effect. M.M.

**A67-20185****SPECTRAL INVESTIGATION OF EMISSION INHOMOGENEITIES IN GaAs INJECTION LASERS.**

S. Raab, H. Bachert, and A. Keiper (Deutsche Akademie der Wissenschaften, II. Physikalisches-Technisches Institut, Berlin, East Germany).

Physica Status Solidi, vol. 19, no. 1, 1967, p. K59-K62. 8 refs.

Spectral investigation of the emission of spatially separated spots. The diodes used for investigating the emission inhomogeneities were prepared from Te-doped basic material by Zn diffusion. The Te-doped GaAs wafers showed doping variations and growth striations caused by the single crystal growth, in agreement with similar phenomena described by other authors. M.M.

**A67-20245****THE USE OF QUASI-CLASSICAL AND BALANCE EQUATIONS FOR THE DESIGN OF STEADY-STATE LASERS.**

A. L. Mikaelian, M. L. Ter-Mikaelian, Ju. G. Turkov, and V. V. D'iachenko.

(Radiotekhnika i Elektronika, vol. 11, Aug. 1966.)

Radio Engineering and Electronic Physics, vol. 11, Aug. 1966, p. 1321-1323. 5 refs. Translation.

Comparison of the results obtained by the balance method of designing steady-state lasers with the results of more rigorous calculations in which mode interference in the cavity is taken into account. Such calculations are performed on the basis of the quasi-classical theory in which the field is described by the classical Maxwell equations and the active atoms are described by Schrodinger's equation. In the case of an optical cavity formed by plane mirrors with two reflection coefficients, two opposite waves are considered. M.M.

# 1966

## LC ENTRIES

A66-81614

**LASER LESIONS: CHANGES IN RETINAL EXCITABILITY.**

A. N. Nicholson and M. J. Ailwood (Roy. AF Inst. of Aviation Med., Farnborough, Hants, Great Britain).

*Nature*, vol. 210, May 7, 1966, p. 637-638.

Experiments were carried out on anesthetized cats with enucleated right eye and fully dilated left eye. Electroretinograms were recorded by means of electrodes resting on the rim of the cornea. Responses to photic stimuli were recorded before and after lesions produced in the nasal part of the retina by a ruby laser beam of nominal output 0.5 J. and pulse duration of 0.5 msec. The lesions varied in diameter from 0.4 to 2.2 mm. When electroretinogram and optic tract potential were registered every 2 sec., the A and B waves were depressed immediately following the lesion. The A wave regained amplitude and the B wave, following initial recovery, declined over the following 50 min. The optic tract potential was reduced. In most cases potential made a partial recovery. When electrodes were placed in both optic tracts, the temporal optic tract potential showed either no change in 40 sec., or a temporary decrease. The spatial relationship between optic tract potentials and their retinal connections, and lesions are discussed. The permanent damage and temporary disorganization of the retino-optic mechanism is suggested.

A66-81895

**COAGULATION OF NERVE CENTERS BY LASER BEAM [COAGULATION DES CENTRES NERVEUX A L'AIDE D'UN RAYONNEMENT LASER].**William Pellet, Gérard Hauchecorne, Monique Denavit, and Robert Naquet (C.N.R.S., Inst. de Neurophysiol. et Psychophysiol., Lab. de Neurophysiol. Appl., Marseille and Inst. Marey, Lab. de Physiol. des Centres nerveux, Paris, France). *Comptes Rendus des séances de l'Académie des Sciences*, vol. 262, Jun. 20, 1966, p. 2634-2636. In French.

Eighty well localized coagulations of deep brain tissue were effected in 19 cats by laser beam (4 J per 200 micro-seconds). Laser energy may someday be used in preference to other methods for the production of localized brain lesions.

A66-81928

**TISSUE DESTRUCTION BY LASER ENERGY, ITS MANAGEMENT AND PREVENTION.**

John Peter Minton (Ohio State U. Hosp., Dept. of Surg., Columbus).

*(Am. Assn. for Surg. of Trauma, 25th Ann. Session, Philadelphia, Oct. 14-16, 1965).**Journal of Trauma*, vol. 6, Mar. 1966, p. 262-266; discussion, p. 266-267. 10 refs.

The unique characteristics of photon energy from lasers has made this source of energy an attractive new tool in many areas of research and development. An increase in laser injuries is anticipated. Injuries from pulsed and continuous laser beams are discussed and methods for the management and prevention of such injuries are presented.

A66-82035

**LASER RADIATION: ACUTE EFFECTS ON CEREBRAL CORTEX.**

Thomas E. Brown, Peter Hornby, R. James Rockwell (Children's Hosp. Res. Found., Laser Lab., Cincinnati, Ohio), Charles True (Cincinnati Gen. Hosp., Dept. of Neuropathol., Ohio), and Robert L. McLaurin (Cincinnati U., Coll. of Med., Dept. of Surg., Div. of Neurosurg., Ohio).

*Neurology*, vol. 16, Aug. 1966, p. 730-737. 15 refs. John A. Hartford Found. supported research.

Effects of focused ruby laser beams on the cerebral cortex of dogs were studied. Energy levels were tested from 5- to 40-joule exit energy with convergent, surface-focused and divergent beams from the liquid nitrogen cooled ruby laser. Discrete and reproducible lesions could be induced. Possible mechanisms of laser effect in tissues include thermal injury as determined by histopathologic criteria, and local anoxia caused by vascular injury. Laser effects in biologic systems are probably determined to a significant extent by the local vascularity and, of course, by pigmentation of the tissues. Laser effects on the cellular elements of the cerebral cortex were not uniform, the neurons being very susceptible to laser energy whereas astrocytes proved more resistant. However, the local vascular bed was severely damaged by laser, and it is possible that the apparent difference in cell susceptibility to laser energy may be secondary to the local anoxia.

A66-82132

**EFFECT OF LASER ON GUINEA PIG COCHLEA [EFFETS DU LASER SUR LA COCHLEE DU COBAYE].**

Maurice Aubry, Michel Burgeat, and Mrs. Bernard Burgeat-Menguy (Fac. de Med., Hop. Lariboisiers, Clin. O.R.L., Lab. de Biophys. et d'Explorations fonctionnelles O.R.L. and Lab. de Biophys., Paris, France).

*Comptes Rendus des Séances de l'Académie des Sciences*, vol. 262, Mar. 28, 1966, p. 1476-1479. In French.

Cochlear microphonic potentials of guinea pigs were not modified by a beam from a ruby laser corresponding to sound pressure of 5000 hertz. In a few instances, cochlear acoustic vibration was measured as a result of the laser beam. The phase deflections recorded may be due to a direct stimulation of the afferent fibers of the cochlear nerve without passing through the Corti organ, or to a transitory change of the resting potential rather than the cochlear microphonic potentials.

A66-82224

**THE THRESHOLD OF THE RETINA TO DAMAGE BY LASER ENERGY.**

Charles J. Campbell, M. Catherine Rittler, Kimiharu S. Noyori (Columbia U., Coll. of Physicians and Surgeons, Presbyterian Hosp., New York City, N. Y.), C. Hermas Swope, and Charles J. Koester (Am. Opt. Co., Res. Div., Southbridge, Mass.).

*Archives of Ophthalmology*, vol. 76, Sep. 1966, p. 437-442. 6 refs.

Characteristic retinal lesions produced by a ruby laser at near threshold energy values were gray, disc shaped, and often difficult to detect. They were similar in appearance in both rabbit and human subjects. The energy values necessary to produce a threshold lesion were significantly lower in rabbits than in human subjects, and in one human subject the threshold was lower in the macula than in other areas of the retina. In rabbits the energy density value of a threshold lesion, immediately after treatment, was not in significant disagreement with previously published values. Finally, the lowest thresholds for both rabbits and humans were found to be 24 to 48 hours after exposure.

# 1967

## LC ENTRIES

### A67-80364

#### RUBY LASER EFFECTS ON THE MONKEY EYE

Arthur E. Jones and Alan J. McCartney (U.S. Army Med. Res. Lab., Fort Knox, Ky.).

*Investigative Ophthalmology*, vol. 5, Oct. 1966, p. 474-483. 14 refs.

Laser pulses of moderate energy but of large retinal subtense produce significantly different retinal lesions than a clinical type of exposure of high energy density and small retinal subtense. A retinal photocoagulation that leads to a satisfactory retinal adhesion, whether produced by white light or laser, is characterized by sharp boundaries, coagulation necrosis of the entire retinal exposure area, and migration of pigment into the area of insult. A low energy density retinal burn of large retinal area is frequently not visible ophthalmoscopically. Histologically, the lesion is not demarcated by sharp boundaries, little coagulation necrosis is seen, and eventually the entire retina becomes involved. Pulsed ruby laser radiation was presented in Maxwellian view to the intact monkey eye. The pulse duration was about 2.0 msec. and the flash energy was varied between 1 and 250 joules. Gross damage to the globe was characterized by corneal pitting, lenticular disruption, bubbles and hemorrhage in the vitreous, and loss of light reflex. Energy levels above 100 joules produced a marked degree of periorbital edema. Histological observations revealed extensive primary damage in the pigment epithelium and choroid and secondary retinal detachment and degeneration peripheral to the area exposed. Progressive retinal detachment and dedifferentiation secondary to the laser lesion are found to occur for a considerable time post exposure. (Author)

### A67-80434

#### PARTIAL INHIBITION OF THE LASER REACTION IN MAN BY TOPICAL CORTICOSTEROIDS.

Leon Goldman and K. W. Kitzmiller (Cincinnati, U., Coll. of Med., Dept. of Dermatol., Laser Lab., Ohio).

*Life Sciences*, vol. 5, Dec. 1966, p. 2215-2224. 11 refs. John A. Hartford Found supported research.

Grant-PHS-OH-00118.

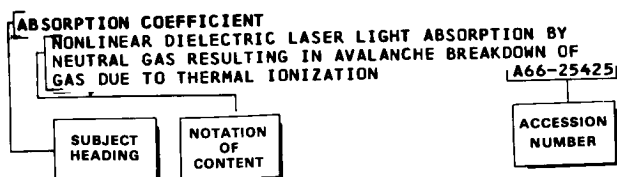
An individual working in laser research was made reactive to impacts of low energy normal mode ruby laser. The energy level at the beginning of the experiments was 100 joules/cm.<sup>2</sup>. His minimal reactive dose was found to be 38 joules/cm.<sup>2</sup>. Partial inhibition to the delayed papular response of his laser skin reaction was done by topical applications of 0.2 and 0.025% fluocinolone acetonide, but not by 0.01% fluocinolone acetonide. Occlusive dressings with 0.01% fluocinolone acetonide, 0.4 mgs. and 0.1 mgs. of fluorandrenolone acetonide per 100 cm.<sup>2</sup> of an occlusive tape were also effective. The failure of inhibition of the petechial phase of the delayed inflammatory response to the laser is not explained. (Author's summary)

# Subject Index

**LASERS AND MASERS** / *a continuing bibliography with indexes*

JULY 1967

## Typical Subject Index Listing



A Notation of Content (NOC), rather than the title of the document, is used to provide a more exact description of the subject matter. In order to provide the user with more than one approach in the search for specific information, a subject may be listed under several subject headings. The accession number is included to assist the user in locating the abstract in the abstract section.

## A

### ABSORBER

EXTENSION OF PAPER ON SATURABLE ABSORBER GIANT PULSE LASERS TO INCLUDE EFFECTS OF FINITE ABSORBER LIFETIME ON PULSE PARAMETERS, NOTING PUMP ROLE A66-18148

### ABSORPTION BAND

MEASUREMENT OF SINGLE LINE IN P BRANCH OF CARBON DIOXIDE VIBRO-ROTATIONAL ABSORPTION BAND USING TUNED OPTICAL MASER SPECTROSCOPY, NOTING PRESENCE OF SHIFTED FREQUENCIES A66-28691

SATURATED ABSORPTION OF COLOR CENTERS IN GLASS SELF- Q-SWITCHED PULSES, AS IN GLASS CODOPED WITH URANYL OXIDE AND ND IONS A67-16678

INTERBAND ELECTRON ABSORPTION AND DISPERSION DURING ONE- AND TWO-PHOTON PROCESSES IN SEMICONDUCTORS SUBJECTED TO ELECTROMAGNETIC FIELD, NOTING LASER APPLICATIONS A67-18798

### ABSORPTION COEFFICIENT

NONLINEAR DIELECTRIC LASER LIGHT ABSORPTION BY NEUTRAL GAS RESULTING IN AVALANCHE BREAKDOWN OF GAS DUE TO THERMAL IONIZATION A66-25425

STEADY STATE VARIATION OF LIGHT INTENSITY WITH DISTANCE FOR MONOCHROMATIC LIGHT, NOTING DEPENDENCE OF ABSORPTION COEFFICIENT ON DEGREE OF EXCITATION OF ELECTRONIC SYSTEM A66-26183

GROWTH RATE OF IONIZATION BY ELECTRON IMPACT IN PRESENCE OF LASER BEAM, ELASTIC AND INELASTIC SCATTERING CROSS SECTIONS, FREE-FREE ABSORPTION, EXCITATION AND IONIZATION COEFFICIENTS, BREAKDOWN TIMES AND THRESHOLDS A66-26193

LINEAR ABSORPTION EFFECT ON THRESHOLD FOR SELF- FOCUSING OF LASER BEAM IN CADMIUM SULFIDE, NOTING VARIATION OF ABSORPTION COEFFICIENT A66-31537

PERFORMANCE OF GA AS SEMICONDUCTOR LASER WITH RESONATOR, NOTING DEPENDENCE OF FORBIDDEN ZONE WIDTH AND ABSORPTION COEFFICIENT ON FREE CARRIER CONCENTRATION AND INCIDENT PHOTON ENERGY A66-38955

FREQUENCY TEMPERATURE DEPENDENCE OF LONGITUDINAL AND TRANSVERSE HYPERSONIC WAVE ABSORPTION

COEFFICIENTS IN QUARTZ AND ARTIFICIAL RUBY CRYSTAL A66-42514

ABSORPTION COEFFICIENTS FOR ALPHA-POLARIZED RADIATION USING RUBY LASER AS COHERENT SOURCE AND EBERT SPECTROMETER AS INCOHERENT SOURCE TR-4 N66-34159

RUBY LASER WITH LIQUID FILTER, CONSIDERING RELATION BETWEEN FILTER EFFICIENCY AND ABSORPTION CURVE PARAMETERS WHEN ACTING AS Q-FACTOR MODULATOR A67-12423

PERFORMANCE OF GA AS SEMICONDUCTOR LASER WITH RESONATOR, NOTING DEPENDENCE OF FORBIDDEN ZONE WIDTH AND ABSORPTION COEFFICIENT ON FREE CARRIER CONCENTRATION AND INCIDENT PHOTON ENERGY A67-15759

OSCILLATION IN CD S CRYSTAL BY RUBY LASER INDUCED TWO-PHOTON EXCITATION, NOTING PROPORTIONALITY OF ABSORPTION COEFFICIENT TO LIGHT BEAM INTENSITY A67-16667

SEMICONDUCTOR LASERS NOTING STRONG FIELD BEHAVIOR AND ABSORPTION COEFFICIENT FOR SATURATION A67-16672

DAMAGE IN GLASS INDUCED BY LINEAR ABSORPTION OF LASER RADIATION NON- Q-SPOILED A67-16794

### ABSORPTION CROSS SECTION

ABSORBER CONCENTRATION EFFECT ON PULSED LASER SYSTEM NOTING PERFORMANCE CHARACTERISTICS, THRESHOLD ENERGY, PUMPING DYNAMICS AND TIME PARAMETERS A66-42254

MEASUREMENT OF EXCITED STATE ABSORPTION CROSS SECTION IN RUBY AT RUBY LASER WAVELENGTH GSP/PH/66-17 N66-34481

### ABSORPTION SPECTRUM

ELLIPTIC CAVITY DESIGN FOR SOLID STATE LASERS, DISCUSSING MULTIPLE REFLECTIONS, ABSORPTION COEFFICIENT, REFRACTION LOSSES, ETC A66-25998

ABSORPTION SPECTRA IN OPTICAL REGION WHEN LASER RADIATION AND CONTINUOUS RADIATION ARE SIMULTANEOUSLY INCIDENT ON MOLECULAR MEDIUM A66-26161

FAR- IR LASER MOLECULAR SPECTROSCOPY INCLUDING IR LASER OSCILLATORS, PHOTON NOISE, DETECTORS AND NUCLEAR OPTICS A66-26195

ORGANIC GAS MAGNETICALLY TUNED LASER SPECTROSCOPY, DISCUSSING RESOLUTION, ABSORPTION SPECTRA AND VIBRATIONAL DEACTIVATION A66-26197

RUBY PHOSPHORESCENCE UNDER INTENSE OPTICAL EXCITATION, INFERRING POSSIBLE RECOMBINATION CHARACTERISTICS FROM INITIAL BRIGHTNESS DECAY A66-28607

STIMULATED EMISSION, ABSORPTION SPECTRA AND LUMINESCENCE OF NEODYMIUM-ACTIVATED YAG CRYSTALS IN PULSED LASER A66-39306

EXPERIMENTAL EXCITED STATE BAND LOCATIONS AND INTENSITIES IN ABSORPTION SPECTRUM OF ELECTRON TRANSITIONS IN OPTICALLY PUMPED RUBY LASER A66-39569

THEORETICAL EXCITED STATE ABSORPTION SPECTRUM OF

- ELECTRON TRANSITIONS IN OPTICALLY PUMPED RUBY LASER A66-39570
- SATURABLE DYES NOTING MODE SELECTION PROPERTIES AND ABSORPTION SPECTRA IN BLEACHED STATE A66-42253
- MULTIPLE CYCLOTRON RESONANCE ABSORPTION LINES IN DEGENERATE VALENCE BANDS OF GE SEMICONDUCTOR STUDIED WITH FAR IR LASER SUBMILLIMETER SPECTROMETER A66-42545
- WATER VAPOR ABSORPTION SPECTRA IN SUBMILLIMETER WAVE REGION, ANALOG-TO-DIGITAL CONVERSION AND RECORDING SYSTEM, AND CARBON DIOXIDE LASER CONSTRUCTION NASA-CR-74971 N66-26261
- MAGNETO-OPTIC OBSERVATIONS WITH GAS LASER, HIGH SPEED MAGNETIZATION REVERSAL EQUIPMENT, INFRARED ABSORPTION SPECTRA, AND CONTINUOUS SOURCE WAVEGUIDE ANTENNA SYNTHESIS NAVWEPS-8847 N66-30157
- VOLUME DENSITY OF HEAT SOURCES IN RUBY LASER ROD BY NUMERICAL INTEGRATION OF PUMPING AND ABSORPTION SPECTRA A67-13117
- OPTICALLY PUMPED RUBY NOTING ABSORPTION AND EMISSION SPECTRUM, TRANSITION STAGES AND PHONON TERMINATED AMPLIFICATION A67-16658
- LASER EMISSION AT 1.06 MICRONS FROM YTTERBIUM-NEODYMIUM GLASS, NOTING LINEARITY OF ENERGY TRANSFER WITH YB CONCENTRATION A67-16664
- CALCIUM FLUORIDE-CERIUM FLUORIDE WITH NEODYMIUM ADDITIONS AS ACTIVE MEDIUM FOR LASERS, DISCUSSING ABSORPTION AND LUMINESCENCE SPECTRA AND INDUCED RADIATION A67-16922
- WAVE INTERACTION IN SATURABLE ABSORBERS, NOTING HOLE BURNING IN DYE SWITCHED RUBY LASER A67-20094
- ABSTRACT**  
 ABSTRACTS OF 15 ARTICLES ON ELECTRONICS, MASERS, SEMICONDUCTOR DEVICES, AND RADIO AND OTHER TRANSMISSION SYSTEMS TAKEN FROM CHINESE PEOPLES REPUBLIC OPEN LITERATURE ATD 66-6 N66-28300
- LASERS AND MASERS - BIBLIOGRAPHY AND ABSTRACTS NASA-SP-7009/01/ N66-35687
- ACCELEROMETER**  
 LASER ACCELERATOR CALIBRATOR AS STANDARD FOR VIBRATION DISPLACEMENT MEASUREMENTS N66-28461
- LASER SYSTEM FOR DYNAMICALLY BALANCING GYRO ROTORS AND STATICALLY BALANCING ACCELEROMETERS NASA-CR-82449 N67-19130
- ACETONE**  
 STIMULATED RAMAN EFFECT IN ACETONE AND ACETONE-CARBON DISULFIDE MIXTURES, NOTING SIMILARITY OF STOKES RADIATION PATTERN TO RAMAN EFFECT A66-28881
- ACOUSTIC ATTENUATION**  
 RUBY LASER-INDUCED EFFECT OF PULSED PRESSURE ON KDP CRYSTAL SURFACE AND THERMAL BULK EFFECT ON EXCITATION OF ULTRASONIC OSCILLATION IN CRYSTAL A66-40318
- ACOUSTIC EXCITATION**  
 HYPERSONIC EXCITATIONS DUE TO BRILLOUIN SCATTERING FOR CASE WITH STOKES FEEDBACK, DERIVING QUANTUM EQUATION OF MOTION FOR CREATION OF LASER AND STOKES MODES AND COUPLED ACOUSTIC MODE A67-16683
- ACOUSTICS**  
 ACOUSTIC WAVE AMPLIFICATION STUDIES, OPTICAL MASER RESEARCH, OSCILLATIONS IN SEMICONDUCTORS, AND BULK INSTABILITIES IN FERROMAGNETIC MATERIALS ML-1424 N66-37453
- MICROWAVE RESEARCH ON ELECTROACOUSTIC AMPLIFIERS, OPTICAL MASERS, STIMULATED RAMAN EFFECT, ACOUSTIC WAVE OPTICS, SEMICONDUCTOR OSCILLATION, NONUNIFORM PLASMAS, AND FERROMAGNETIC METALS ML-1464 N67-16325
- ACOUSTIC WAVE AMPLIFICATION, OPTICAL MASER, TUNABLE LASER, ACOUSTIC WAVE OPTICS, NONUNIFORM PLASMA THEORY, SEMICONDUCTOR OSCILLATION, AND FERROMAGNETIC METAL STUDIES IN MICROWAVE PROGRAM ML-1436 N67-16339
- ACRYLATE**  
 ORGANIC GLASS DISINTEGRATION INDUCED BY PULSED LASER BEAMS A67-12241
- ACTINIDE**  
 FLUORESCENCE OF RARE EARTH, ACTINIDE AND TRANSITION METAL IONS IN INSULATING CRYSTALS AS RESULT OF OPTICAL EXCITATION, DISCUSSING SPECTROSCOPIC PROPERTIES AND OPERATING CHARACTERISTICS A66-36969
- AEROSOL**  
 C AT DETECTION FROM DOPPLER SHIFT IN LASER LIGHT BACKSCATTERED FROM ATMOSPHERIC AEROSOL A66-28930
- RADIATION ATTENUATION EFFECT OF ATMOSPHERIC AEROSOLS ON ALL-WEATHER AIRCRAFT LANDING GUIDANCE SYSTEMS USING LASERS A66-36051
- LASER SYSTEM FOR METEOROLOGICAL DATA USING OSCILLOSCOPE TO DISPLAY RETURN SIGNAL, TRANSLATED AS CONCENTRATIONS OF MATTER OR AEROSOLS A66-43044
- AEROSPACE MEDICINE**  
 BIOMEDICAL PREPARATIONS FOR MANNED LUNAR LANDING, COLD ACCLIMATIZATION IN FAR NORTH, AND LASERS IN OPHTHALMOLOGY JPRS-36229 N66-33200
- AEROSPACE TECHNOLOGY**  
 RING LASER INERTIAL SENSOR FOR AEROSPACE SYSTEMS OBTAINING HIGH ACCURACY ANGULAR RESOLUTION AND MECHANICAL SIMPLICITY A67-15665
- LASER APPLICATIONS IN AEROSPACE TECHNOLOGY N67-18668
- AFTERGLOW**  
 HELIUM-NEON GAS LASER USED TO DETERMINE ELECTRON DENSITY VARIATION, SPATIAL AND TEMPORAL, IN AFTERGLOW OF Z-PINCH IN H AT 100 MTORR A66-26239
- HELIUM-NEON LASER AFTERGLOW AND METASTABLE HELIUM ATOMS UNDER LONG PULSE EXCITATION A66-27335
- HELIUM-NEON LASER INTERFEROMETERS TO OBTAIN ELECTRON AND NEUTRAL ATOM DENSITIES IN HELIUM AND ARGON AFTERGLOW PLASMAS AROD-4832-7 N66-25866
- OPTICAL AND ELECTRON INTERACTIONS WITH METASTABLES - AFTERGLOW PLASMA IONIZATION PROCESS REPT.-24 N66-26512
- AIRBORNE EQUIPMENT**  
 PROGRAM PLANNING, GROUND SUPPORT AND AIRBORNE EQUIPMENT FOR LASER SPACE COMMUNICATION SYSTEM NASA-CR-78855 N66-39446
- AIRCRAFT ENGINE**  
 PLASMA PROPERTIES USING LASERS AND SPECTROSCOPY - TRANSMISSION DESIGN REQUIREMENTS FOR AIRCRAFT GAS TURBINES N66-27060
- AIRCRAFT GUIDANCE**  
 RADIATION ATTENUATION EFFECT OF ATMOSPHERIC AEROSOLS ON ALL-WEATHER AIRCRAFT LANDING GUIDANCE SYSTEMS USING LASERS A66-36051
- AIRCRAFT LANDING**  
 OPTO-ELECTRONIC AIRCRAFT ALTITUDE CONCEPT BASED ON PROPERTIES OF ELECTRON INJECTION LASERS AND SILICON PHOTODIODES N67-13079

## ALFVEN WAVE

SUMMARY REPORTS ON RESEARCH IN PLASMA SOURCES,  
IONIZATION FRONTS, COMPRESSIONAL WAVES, GIANT  
ALFVEN WAVES, MICROWAVE INTERFEROMETRY, LASERS,  
AND MAGNETO- KERR EFFECT  
NP-15940 N66-34712

PLASMA PHYSICS STUDIES - LASER INTERFEROMETER TO  
MEASURE STRAIN RATE AT KERN RIVER FAULT, PLASMA  
DIFFUSION, ALFVEN WAVES IN RELATIVISTIC WAVES,  
AND PLASMA RADIATION FROM SILVER FOILS  
N66-36419

## ALIGNMENT

ALIGNMENT OF LASER MIRRORS USING GAS LASER WITH  
HIGHLY COLLIMATED BEAM OF SMALL DIAMETER  
A66-25824

RESONATOR MISALIGNMENT EFFECT ON OUTPUT OF NEON-  
HELIUM LASER WITH SPHERICAL MIRRORS  
A66-41830

## ALKALI HALIDE

DISINTEGRATION OF ALKALI HALIDE SINGLE CRYSTALS,  
POLYMERS AND GLASSES UNDER LASER RADIATION, NOTING  
PARAMETERS OF DISINTEGRATION REGION MAGNITUDE  
A66-34681

DISINTEGRATION OF ALKALI HALIDE SINGLE CRYSTALS,  
POLYMERS AND GLASSES UNDER LASER RADIATION, NOTING  
PARAMETERS OF DISINTEGRATION REGION MAGNITUDE  
A67-14367

JOURNAL OF APPLIED SPECTROSCOPY ARTICLES ON RUBY  
LASERS AND ACTIVATED ALKALI HALIDE SCINTILLATORS  
FTD-HT-66-310 N67-17169

## ALL-WEATHER AIR NAVIGATION

RADIATION ATTENUATION EFFECT OF ATMOSPHERIC  
AEROSOLS ON ALL-WEATHER AIRCRAFT LANDING GUIDANCE  
SYSTEMS USING LASERS  
A66-36051

## ALUMINUM

LASER BEAM ENERGY PROFILE DETERMINED BY MULTIPLE-  
LAYER ALUMINUM FOIL TECHNIQUE  
A66-31217

HYPERVELOCITY IMPACT TESTS ON ALUMINUM TARGET  
PLATES TO EVALUATE MICROMETEOROID IMPACT  
SENSORS - LASER SIMULATION STUDY  
NASA-CR-76102 N66-30173

HIGH TEMPERATURE PLASMAS PRODUCED BY Q-SWITCHED  
LASER BEAM FOCUSED ON ALUMINUM TARGETS  
TID-22928 N67-13974

ALUMINUM COLD CATHODES FOR SINGLE MODE HELIUM  
NEON GAS LASERS  
N67-16017

## ALUMINUM COMPOUND

SOLID STATE MASER OSCILLATOR OPERATING IN ZERO  
FIELD CONFIGURATION, USING FERRIC ION SUBSTITUTED  
AS IMPURITY IN ALUMINUM NITRATE HOST CRYSTAL  
A66-42551

## ALUMINUM OXIDE

ALUMINA HIGH TEMPERATURE GAS DISCHARGE TUBE FOR  
INVESTIGATION OF PULSED METAL VAPOR LASER  
OSCILLATIONS  
A66-35810

ELECTRON BEAM MELTING AND FLOAT ZONE CRYSTAL  
GROWTH TECHNIQUES FOR PROCESSING ALUMINUM OXIDE  
AND RELATED MATERIALS USED IN LASER TECHNOLOGY  
AFCRL-66-473 N67-10948

## AMMONIA

TUNING OF AMMONIA BEAM MASER RESONATOR BASED ON  
FREQUENCY SHIFT METHOD, NOTING HYSTERESIS  
APPEARANCE AND ELIMINATION  
A66-31696

FREQUENCY STABILITY OF DOUBLE BEAM AMMONIA LASER  
WITH THERMOSTATIC QUARTZ RESONATORS ON 3-2 LINE  
A67-10247

## AMMONIUM PHOSPHATE

U V RADIATION GENERATION FROM OUTPUT OF ND GLASS  
LASER BY FREQUENCY DOUBLING IN AMMONIUM DIHYDROGEN  
PHOSPHATE CRYSTALS  
A67-18712

## AMPLIFICATION FACTOR

NONLINEAR QUANTUM EFFECT IN SOLID STATE LASERS  
USING PARAMAGNETIC CRYSTALS, NOTING RAMAN EFFECT  
AND GAIN DEPENDENCE ON PUMPING POWER  
A66-26172

REGENERATIVE HELIUM-NEON LASER WITH AMPLIFICATION  
COEFFICIENT OF 1000  
A66-29352

REGENERATIVE HELIUM-NEON LASER WITH AMPLIFICATION  
COEFFICIENT OF 1000  
A66-37357

SINGLE PULSE OPERATION OF LASERS, NOTING ENERGY  
STORAGE AND AMPLIFICATION EFFECT FOR FOUR- AND  
THREE-LEVEL ACTIVE MEDIUM  
A66-39711

## AMPLIFIER

GAS LASER ALIGNMENT, OBTAINING OSCILLATION ON  
THREE LINES OF HE- NE LASER  
A66-39718

ULTRALOW-NOISE TUNABLE S-BAND AMPLIFIER USING  
TWM AS SECOND STAGE  
A67-10106

## AMPLITUDE

AMPLITUDE AND FREQUENCY CHARACTERISTICS OF  
HYDROGEN-ATOM BEAM MASER  
A67-11574

PHASE LOCKED LASER LOOP FOR AMPLITUDE AND PHASE  
MEASURING DEVICE FOR COHERENT OPTICAL WAVE FRONTS  
A67-15076

## AMPLITUDE MODULATION

ATMOSPHERIC TURBULENCE EFFECTS ON LASER BEAM  
PROPAGATION, NOTING BEAM CROSS SECTION, PHASE  
VARIATION, AM AND FM, ETC  
A66-27035

PLASMA FLUCTUATION EFFECT ON GAS LASER NOISE,  
NOTING RELATION BETWEEN MODULATION AMPLITUDE OF  
LIGHT OUTPUT AND FREQUENCY NOISE AND OSCILLATION  
SPECTRUM  
A66-41294

STATISTICAL DISTRIBUTION OF AM LASER SIGNAL  
ENVELOPE UPON PASSAGE THROUGH TURBULENT ATMOSPHERE  
A67-13988

OSCILLATION AMPLITUDE MODULATION IN AMMONIA BEAM  
MASER OSCILLATOR WITH SINGLE CAVITY FOLLOWED BY  
TWO CAVITIES IN CASCADE  
A67-16636

TIME STRUCTURE AND AMPLITUDE SELF-MODULATION OF  
EMISSION FROM GA AS INJECTION LASER OBSERVED,  
USING ELECTRON-OPTICAL CONVERTER  
A67-17756

KERR CELL PROPERTIES NOTING FOUR-ELECTRODE CELL  
GIVING FREQUENCY SHIFT OF 60 MC FOR LASER BEAM  
A67-19552

## ANALOG-TO-DIGITAL CONVERTER

WATER VAPOR ABSORPTION SPECTRA IN SUBMILLIMETER  
WAVE REGION, ANALOG-TO-DIGITAL CONVERSION AND  
RECORDING SYSTEM, AND CARBON DIOXIDE LASER  
CONSTRUCTION  
NASA-CR-74971 N66-26261

## ANGULAR DISTRIBUTION

ANGULAR DISTRIBUTION OF STIMULATED RAMAN  
RADIATION, DISCUSSING AXIAL AND OFF-AXIAL STOKES  
AND SURFACE RADIATION MECHANISM  
A66-25189

MEASUREMENT OF RADIATION PATTERN OF RUBY LASER  
EMISSION FOR VARIOUS RESONATORS AND OPERATING  
REGIMES, NOTING LASER EFFECT ON ANGULAR HALF-  
WIDTH VALUES  
A66-30847

## ANGULAR MOTION

ALIGNMENT OF ANGULAR POSITIONS OF SPHERICAL MIRROR  
AND GRATING OF FASTIE-EBERT SPECTROMETER, USING  
BRIGHT COLLIMATED MONOCHROMATIC BEAM OF HE- NE  
LASER  
A66-26564

## ANGULAR VELOCITY

RING LASER SENSOR PARAMETERS AND CHARACTERISTICS,  
NOTING APPLICATION TO MEASUREMENT OF ANGULAR RATE,  
MASS FLOW, NAVIGATION AND GUIDANCE  
A66-35533

RING LASER ROTATION SENSING SYSTEM, EVALUATING

- ACCURACY LIMIT FOR MINIMIZED INACCURACY OF  
KNOWN SOURCES OF ERROR A67-13992
- RING LASER INERTIAL SENSOR FOR AEROSPACE SYSTEMS  
OBTAINING HIGH ACCURACY ANGULAR RESOLUTION AND  
MECHANICAL SIMPLICITY A67-15665
- ANIMAL STUDY**  
VISUAL ACUITY DECREMENT FROM LASER LESION IN FOVEA  
OF STUMP TAIL MACAQUE MONKEYS A67-16287
- ANISOTROPIC FLUID**  
NONLINEAR MEDIUM ANISOTROPY AND SATURATION  
EFFECTS ON ORIENTATION OF POLARIZATION ELLIPSE OF  
GAS LASER MODE A67-17823
- ANISOTROPIC MATERIAL**  
CROSS SECTION FOR INELASTIC SCATTERING OF  
ELECTROMAGNETIC RADIATION BY ELECTRON DENSITY  
FLUCTUATIONS IN ANISOTROPIC SOLIDS, USING LASER  
SOURCES, INVESTIGATING LANDAU AND COLLISION  
DAMPING OF PLASMONS A66-26153
- ANTENNA**  
SIGNAL EXCITATION IN NEGATIVELY CHARGED ANTENNA  
ROD IN EFFECT OF UNFOCUSED LASER BEAM A66-42753
- SIGNAL EXCITATION IN NEGATIVELY CHARGED ANTENNA  
ROD IN EFFECT OF UNFOCUSED LASER BEAM A67-10835
- ANTHRACENE**  
NATURE OF EXCITED STATE RESULTING FROM TWO-QUANTUM  
ABSORPTION ASSOCIATED WITH FLUORESCENCE IN  
ANTHRACENE PRODUCED BY RUBY LASER A67-16130
- APPROXIMATION METHOD**  
GEOMETRICAL OPTICS APPROXIMATION SOLUTION TO  
RADIATION POWER OF GAS LASER AS FUNCTION OF  
MIRROR MISALIGNMENT ANGLE A66-34884
- TEMPERATURE FIELD OF ACTIVE MEDIUM OF PULSED LASER  
USING VARIATIONAL METHODS, CONSIDERING TWO  
APPROXIMATE SOLUTIONS A67-16935
- ARC DISCHARGE**  
PULSED ARC XENON DISCHARGES USED FOR OPTICAL  
PUMPING OF HIGH ENERGY LASERS A66-31537
- ARGON**  
METAL WALL IONIZED ARGON LASERS, DISCUSSING USE OF  
WATER-COOLED QUARTZ DISCHARGE CHANNELS, CW  
LASERS, DEVELOPMENT OF SATISFACTORY METAL, ETC A66-25555
- ELECTRON IMPACT EXCITATION MECHANISM OF ARGON-ION  
CONTINUOUS AND LONG PULSE LASERS A66-26206
- TRANSITION PROBABILITIES AND LIFETIMES IN IONIZED  
ARGON GAS LASERS A66-26207
- LIGHT ENERGY MEASUREMENTS MADE WITH ARGON BOMB  
USED AS CHEMICALLY POWERED LASER PUMP A66-35388
- INTRACAVITY INTERFEROMETER LASER MEASUREMENTS OF  
POWER GAIN AND OUTPUT IN SINGLE-FREQUENCY AR  
LASER AND 6328-ANGSTROM NE ISOTOPE SHIFT A66-40110
- DIRECT CURRENT PUMPING AND COMBINED MICROWAVE  
ELECTRON-CYCLOTRON RESONANCE WITH DIRECT CURRENT  
PUMPING EFFECTS ON DISCHARGE BEHAVIOR AND ARGON  
LASER OPERATION A66-29240
- ABSOLUTE DIRECT EXCITATION CROSS SECTION FROM  
NEUTRAL GROUND STATE FOR UPPER LEVELS OF  
TRANSITION IN ARGON LASER A67-12520
- TWYMAN- GREEN ARRANGEMENT OF INTERFEROMETER WITH  
NARROW LASER BEAM AND TWIN PHOTOMULTIPLIERS,  
EXAMINING STRONG SHOCKS IN ARGON IN 15.2 CM SHOCK  
TUBE A67-12688
- RELATIVE INTENSITIES AND CASCADE TRANSITION RATIO  
IN CW AR II LASER NEAR 4103.9 ANGSTROMS A67-19560
- ARGON PLASMA**  
ELECTRON AND NEUTRAL ATOM DENSITIES IN HELIUM AND  
ARGON AFTERGLOW PLASMA OBTAINED BY TWO HELIUM-NEON  
LASER INTERFEROMETERS, NOTING TEMPORAL DEPENDENCE  
OF ELECTRON DECAY A66-41364
- HELIUM-NEON LASER INTERFEROMETERS TO OBTAIN  
ELECTRON AND NEUTRAL ATOM DENSITIES IN HELIUM  
AND ARGON AFTERGLOW PLASMAS A66-25866
- SELF-LOCKING MODES IN ARGON ION LASER, OBSERVING  
SUBNANOSECOND PULSATION OF LASER OUTPUT WITH  
WIDEBAND PHOTOMULTIPLIER A67-12503
- C W ARGON ION LASER SCATTERING IN ARGON PLASMA,  
NOTING RESONANCE AND CORRELATION BETWEEN DATA AND  
PLASMA PROPERTIES A67-16665
- CHARGED PARTICLES FOR LASING, DISCUSSING  
MANUFACTURE OF ARGON LASER A67-19083
- HELIUM-NEON LASER USED WITH VARICUS  
INTERFEROMETERS TO MEASURE RAPID ELECTRON  
DENSITY CHANGES IN ARGON PLASMA A67-15240
- ARSENIC COMPOUND**  
INDIUM ARSENIC ANTIMONIDE SINGLE CRYSTALS IN P-N  
JUNCTION LASER A66-31767
- INDIUM ARSENIC ANTIMONIDE SINGLE CRYSTALS IN P-N  
JUNCTION LASER A67-10087
- ASTROMETRY**  
MEASUREMENT OF DISTANCE TO MOON BY OPTICAL  
RADAR, DISCUSSING RUBY LASER/PHOTOMULTIPLIER  
APPARATUS AND PROCEDURE A66-30291
- ASTRONOMICAL SPECTRUM**  
MASER AMPLIFIER BASED ON UV CONTINUUM PUMPING  
FROM NEARBY STARS, EXPLAINING 18-CM OH EMISSION  
FROM ANOMALOUS H-2 REGIONS A66-43042
- ASTRONOMICAL TELESCOPE**  
LARGE APERTURE TELESCOPE FOR USE AS COHERENT  
OPTICAL DEEP SPACE COMMUNICATIONS RECEIVER  
NASA-CR-81677 A67-17946
- ATMOSPHERE**  
OPTICAL PHENOMENA IN LIQUID AND GASEOUS MEDIA  
AD-626808 A66-35526
- ATMOSPHERE MODEL**  
STATISTICAL MODELS USED IN COMPUTER PROGRAM TO  
SIMULATE ATMOSPHERE EFFECT ON LASER RECEIVER A67-15746
- ATMOSPHERIC ATTENUATION**  
RADIATION ATTENUATION EFFECT OF ATMOSPHERIC  
AEROSOLS ON ALL-WEATHER AIRCRAFT LANDING GUIDANCE  
SYSTEMS USING LASERS A66-36051
- ATMOSPHERIC COMPOSITION**  
ATMOSPHERIC OBSERVATION WITH ADVANCED LIGHT RADAR,  
NOTING EQUIPMENT CHARACTERISTICS, MOLECULAR  
SCATTERING MECHANISM, ETC A66-26133
- ATMOSPHERIC EXPLORATION WITH LIDAR, NOTING HIGH  
RESOLUTION AND SENSITIVITY A66-28600
- DETECTING CONCENTRATION OF NITRIC OXIDE IN  
METASTABLE STATE IN UPPER ATMOSPHERE, USING GIANT-  
PULSE RAMAN LASER SOURCES A66-43022
- LIGHT BACKSCATTERING EXPERIMENT IN LASER PROBING  
STUDIES OF ATMOSPHERIC LAYER ABOVE 100 KM  
NASA-CR-74730 A66-24998
- ATMOSPHERIC CONDITION EFFECT**  
COHERENT LASER LIGHT USE IN ATMOSPHERIC  
COMMUNICATIONS SYSTEM, DISCUSSING EFFECT OF  
ATMOSPHERIC TURBULENCE AND SMALL VIBRATIONS ON  
COHERENT DETECTION EFFICIENCY AND SNR A66-36930



- DEGREE OF COHERENCE OF OPTICAL BEAM TRAVERSING  
ATMOSPHERIC MEDIUM INCLUDING SIMULATED FOG FOR  
DESIGN OF OPTICAL HETERODYNE RECEIVER  
NASA-CR-76078 N66-29972
- EXPERIMENT SPECIFICATIONS FOR DETERMINING  
ATMOSPHERIC EFFECTS ON LASER PROPAGATION  
NASA-CR-79094 N66-39992
- ATMOSPHERIC CONDUCTIVITY**  
LASER COMMUNICATIONS SYSTEM DESIGN, DESCRIBING  
RANGE EQUATION, MODULATION AND DETECTION  
TECHNIQUES, ATMOSPHERIC EFFECTS, ETC  
A66-37257
- OPTICAL COMMUNICATION SYSTEMS, DISCUSSING  
AVAILABLE EQUIPMENT, TRANSMISSION CHARACTERISTIC,  
LACK OF LONG DISTANCE OPERATION RELIABILITY, ETC  
A66-42805
- ATMOSPHERIC ELECTRICITY**  
GIANT-PULSE LASER-INDUCED ATMOSPHERIC ELECTRIC  
BREAKDOWN CAUSING OPTICAL FREQUENCY DISCHARGE  
A66-26194
- ATMOSPHERIC HEATING**  
ATMOSPHERIC HEATING BY LASER PULSES IN  
TRANSMISSION WINDOWS  
TRW-4535-6003-RO-000 N66-34232
- ATMOSPHERIC IONIZATION**  
THRESHOLD DATA FOR RUBY AND NEODYMIUM LASER  
PULSE-INDUCED BREAKDOWN IN Xe, Ar, Kr, Ne,  
He, OXYGEN, NITROGEN, AIR AND CARBON DIOXIDE  
A66-26191
- ATMOSPHERIC REFRACTION**  
VELOCITY ABERRATION AND ATMOSPHERIC REFRACTION  
PERTAINING TO LASER SATELLITE COMMUNICATION  
EXPERIMENTS, OBTAINING EQUATIONS FOR ESTIMATION OF  
EFFECTS  
A67-12054
- WAVELENGTH DEPENDENCE OF SPECTRUM OF LASER BEAMS  
TRAVERSING ATMOSPHERE  
A67-16793
- ATMOSPHERIC SCATTERING**  
LASER RADIATION COHERENCE PROPERTY DETERIORATION  
AND MOLECULAR SCATTERING DURING PROPAGATION  
THROUGH TURBULENT ATMOSPHERE  
A66-27131
- UPPER ATMOSPHERIC LIGHT SCATTERING OF VERTICALLY  
FIRED RUBY-LASER PULSE  
A66-33348
- LASER BACKSCATTER SIGNATURES AND TRANSMISSIVITY  
OVER HORIZONTAL AND SLANT PATHS WITH RESPECT TO  
MEASURING EXTINCTION COEFFICIENTS OF SCATTERING  
MEDIA  
A67-14677
- HIGH ALTITUDE ATMOSPHERIC SCATTERING OF INTENSE  
LIGHT FROM RUBY LASER BEAM INTERPRETED PRINCIPALLY  
IN TERMS OF RAYLEIGH SCATTERING FROM ATMOSPHERIC  
MOLECULES  
A67-19419
- ATMOSPHERIC TEMPERATURE**  
DENSITY AND TEMPERATURE OF UPPER ATMOSPHERE,  
SATELLITE TRACKING, GEODETIC APPLICATIONS AND LONG  
DISTANCE MEASUREMENTS, USING LASER OUTPUT  
A67-17591
- ATMOSPHERIC TURBULENCE**  
ATMOSPHERIC TURBULENCE EFFECTS ON LASER BEAM  
PROPAGATION, NOTING BEAM CROSS SECTION, PHASE  
VARIATION, AM AND FM, ETC  
A66-27035
- LASER RADIATION COHERENCE PROPERTY DETERIORATION  
AND MOLECULAR SCATTERING DURING PROPAGATION  
THROUGH TURBULENT ATMOSPHERE  
A66-27131
- FLUCTUATIONS IN MEAN REFRACTIVE INDEX OVER LONG  
PATH THROUGH TURBULENT ATMOSPHERE EXAMINED, USING  
MICHELSON INTERFEROMETER WITH HE- NE LASER  
SOURCE  
A66-32618
- COHERENT LASER LIGHT USE IN ATMOSPHERIC  
COMMUNICATIONS SYSTEM, DISCUSSING EFFECT OF  
ATMOSPHERIC TURBULENCE AND SMALL VIBRATIONS ON  
COHERENT DETECTION EFFICIENCY AND SNR  
A66-36930
- ATMOSPHERIC TURBULENCE EFFECT ON LASER BEAM  
INTENSITY DISTRIBUTION  
A66-41030
- ATMOSPHERIC TURBULENCE EFFECT ON FREQUENCY SPECTRA  
OF LIGHT INTENSITY FLUCTUATIONS EXAMINED, USING  
HE- NE LASER  
A66-41031
- TROPOSPHERIC PROPAGATION USING LASER AS  
TRANSMITTER, ANALYZING EFFECTS OF BENARD CELLS,  
TURBULENCE, WIND SHEAR, ETC  
A66-42367
- AMPLITUDE AND FREQUENCY MEASUREMENT OF RANDOM  
POSITION FLUCTUATION OF STATIONARY LASER OPTICAL  
SOURCE DUE TO ATMOSPHERIC TURBULENCE  
NASA-TN-D-3439 N66-25558
- STATISTICAL DISTRIBUTION OF AM LASER SIGNAL  
ENVELOPE UPON PASSAGE THROUGH TURBULENT ATMOSPHERE  
A67-13988
- LASER APPLICABILITY TO LINE-OF-SIGHT ATMOSPHERIC  
TURBULENCE PARAMETERS  
A67-17383
- ATOM CONCENTRATION**  
ELECTRON AND NEUTRAL ATOM DENSITIES IN HELIUM AND  
ARGON AFTERGLOW PLASMA OBTAINED BY TWO HELIUM-NEON  
LASER INTERFEROMETERS, NOTING TEMPORAL DEPENDENCE  
OF ELECTRON DECAY  
A66-41364
- ATOMIC BEAM**  
HIGH FREQUENCY-STABILITY EM WAVE SOURCE, APPLYING  
THERMAL EXCITATION METHODS TO PENCIL QUANTUM  
GENERATOR IN IR REGION  
A66-39336
- HIGH FREQUENCY-STABILITY EM WAVE SOURCE, APPLYING  
THERMAL EXCITATION METHODS TO PENCIL QUANTUM  
GENERATOR IN IR REGION  
A66-39706
- ATOMIC BEAM PREPARATION TECHNIQUES FOR HYDROGEN  
MASER OPERATION WITH UNPOLARIZED ATOMS  
ECOM-2720 N66-38178
- AMPLITUDE AND FREQUENCY CHARACTERISTICS OF  
HYDROGEN-ATOM BEAM MASER  
A67-11574
- OPTIMAL CONSTRUCTION OF ATOMIC HYDROGEN FREQUENCY  
STANDARD FOR SPACECRAFT APPLICATION  
NASA-CR-82491 N67-19095
- ATOMIC CLOCK**  
ATOMIC MASER CLOCKS ROTATION WITH EARTH, DERIVING  
FORMULA FOR RELATIVE DRIFT AT WIDELY SEPARATED  
LOCALITIES ARISING FROM LOCAL GRAVITATIONAL  
POTENTIALS  
A66-30187
- ATOMIC TIME STANDARDS, DESCRIBING CESIUM BEAM  
STANDARD, AMMONIA MASER AND GAS-CELL TYPE CLOCKS  
A66-35468
- ATOMIC COLLISION**  
AMPLIFICATION OF INTERACTION OF ATOMS AND OF  
PULSED OR PERIODIC COOLING OF TRANSPARENT MEDIA  
PRODUCED BY LASER BEAM, NOTING CHANGES IN KINETIC  
ENERGY OF ATOMS  
A66-26021
- OUTPUT POWER FREQUENCY RESPONSE OF SINGLE MODE  
HELIUM NEON LASER, DETERMINING EFFECTS OF ATOMIC  
COLLISIONS ON FREQUENCY RESPONSE OF INDIVIDUAL  
ATOMS  
A66-29812
- ATOMIC COLLISIONS, EXCITATION TRANSFER PROCESSES  
AND ENERGY LEVEL TRANSITION PROBABILITIES IN  
PLASMA OF GAS LASERS  
A66-39305
- EFFECT OF DOPPLER AND IMPACT LINE BROADENING OF  
SPECTRAL CHARACTERISTICS OF GAS LASER, NOTING  
STANDING MONOCHROMATIC WAVE SATURATION  
A67-14197
- PHASE AND AMPLITUDE FLUCTUATION OF GAS AND SOLID  
STATE LASERS, ACCOUNTING FOR NOISE CAUSED BY  
PUMPING, INCOHERENT DECAY, LATTICE VIBRATIONS AND  
ATOMIC COLLISIONS  
A67-14949
- ATOMIC EXCITATION**  
ELECTRON IMPACT EXCITATION MECHANISM OF ARGON-ION  
CONTINUOUS AND LONG PULSE LASERS  
A66-26206

- SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-  
PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION  
A66-27187
- RUBY PHOSPHORESCENCE UNDER INTENSE OPTICAL  
EXCITATION, INFERRING POSSIBLE RECOMBINATION  
CHARACTERISTICS FROM INITIAL BRIGHTNESS DECAY  
A66-28607
- TRANSVERSE AND AXIAL MAGNETIC FIELD EFFECTS ON GAS  
LASERS, DERIVING EXPRESSION FOR ATOMIC AND  
MACROSCOPIC POLARIZATION, DETERMINING OSCILLATION  
MODE CHARACTERISTICS, FREQUENCY RESPONSES, ETC  
A66-29813
- DEGREE OF EXCITATION OF METASTABLE STATE  
DETERMINED, USING LUMINESCENCE SATURATION  
PHENOMENON, CALCULATING POPULATION OF WORKING  
LEVEL OF LASER SUBSTANCE A66-30846
- SEMICONDUCTOR LASERS WITH HIGH POWER EFFICIENCY  
OBTAINED VIA ELECTRON BEAM EXCITATION ON CRYSTALS  
OF MIXED CADMIUM-SULFIDE-SELENIDE ALLOY  
A66-31533
- GAS LASER FREQUENCY AND EMITTED POWER DEPENDENCE  
ON RESONATOR TUNING A66-39308
- SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-  
PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION  
A66-43085
- TUNABLE LASER BEAM FOR INVESTIGATING HIGHLY  
EXCITED STATES OF ATOMS IN DISCHARGE  
N66-36881
- C W HE- NE LASER COMPARED WITH MERCURY ARC  
SOURCE, OBTAINING RAMAN SPECTRA OF CARBON  
TETRACHLORIDE BY THREE METHODS OF EXCITATION  
A67-13912
- PULSED GAS DISCHARGE LASERS NOTING REQUIRED  
ENERGY LEVEL FOR MAXIMUM EFFICIENCY, EXPERIMENTAL  
TECHNIQUES AND RESULTS A67-16650
- ATOMIC GAS**  
BREAKDOWN BY NEODYMIUM GLASS LASER RADIATION IN  
ATOMIC AND MOLECULAR GASES, DETERMINING POWER  
DENSITIES, NOTING RELATION OF PRESSURE TO  
BREAKDOWN POWER A66-30938
- DUAL CHANNEL TRAVELING WAVE MASER FOR INTEGRATION  
IN CLOSED CYCLE REFRIGERATOR N67-15908
- ATOMIC STRUCTURE**  
NONLINEAR ATTENUATION OR GAIN CHARACTERISTICS OF  
DOPPLER-BROADENED ATOMIC RESONANCE INVOLVING  
LEVELS WITH SMALL SPLITTINGS, NOTING MODE COUPLING  
OF GAS LASER A67-10152
- LASER AS SOURCE OF OPTICAL FOURIER ANALYSIS OF  
ATOMIC STRUCTURE OF CRYSTALS A67-16921
- ATTITUDE CONTROL**  
OPTICAL SYSTEM CONSISTING OF POLARIZED LASER BEAMS  
FOR MONITORING MISSILE ATTITUDE DURING EARLY  
LAUNCH PHASE A67-14505
- AUDIOFREQUENCY**  
AUDIO FREQUENCY PROPORTIONAL TO ROTATION RATE OF  
REENTRANT LASER CAVITY SYSTEM DERIVED FROM SINGLE  
OUTPUT BEAM A67-11322
- AUREOLE**  
FAST OVERLAP OF MICROWAVE RADIATION BY IONIZATION  
AUREOLE OF SPARK IN LASER BEAM A66-36719
- AUTOCORRELATION**  
LINE WIDTH OF CW GA- AS LASERS MEASURED USING  
HOMODYNE DETECTION AND AUTOCORRELATION  
A67-16670
- AUTOMATIC CONTROL**  
AUTOMATIC FREQUENCY CONTROL SYSTEM FOR ABSOLUTE  
FREQUENCY STABILIZATION  
IER-5 N67-15312
- AUTOMATIC DATA PROCESSING SYSTEM**  
UNIDENSITY COHERENT LIGHT PROCESSING SYSTEM
- / UNICON/ A67-11034
- AUTOMATIC FREQUENCY CONTROL**  
HE- NE LASER FREQUENCY STABILIZATION USING FOUR  
AUTOMATIC FREQUENCY CONTROL / AFC/ SYSTEMS  
A67-17965
- AVALANCHE**  
NONLINEAR DIELECTRIC LASER LIGHT ABSORPTION BY  
NEUTRAL GAS RESULTING IN AVALANCHE BREAKDOWN OF  
GAS DUE TO THERMAL IONIZATION A66-25425
- AVALANCHE RECTIFIER**  
LOW NOISE PHOTODIODES WITH AVALANCHE  
MULTIPLICATION FOR HIGH SENSITIVITY, NOTING  
CAPABILITY FOR LOW INTENSITY WIDEBAND SIGNAL  
DETECTION, PERFORMANCE IN IR REGION, ETC  
A66-31934
- AVALANCHE TRANSISTOR GENERATION OF JITTER-FREE  
NANOSECOND CURRENT PULSES FOR DRIVING GA AS LASER  
DIODES AT LOW TEMPERATURES A66-37453
- AZIDE**  
LEAD AZIDE AND PENTAERYTHRIT TETRANITRATE  
EXPLOSION TRIGGERED BY LASER RADIATION  
A67-19315
- B**
- BACKGROUND RADIATION**  
SOLAR NOISE IN OPTICAL COMMUNICATIONS, BACKGROUND  
RADIATION DEPENDENCE ON DETECTOR APERTURE, NOISE  
POWER AND APPLICATION TO GA AS DIODES AND GAS  
LASERS A66-25833
- BACKSCATTER**  
C AT DETECTION FROM DOPPLER SHIFT IN LASER LIGHT  
BACKSCATTERED FROM ATMOSPHERIC AEROSOL  
A66-28930
- STIMULATED BRILLOUIN SCATTERING FROM NITROGEN AND  
METHANE USING GIANT PULSE LASER, NOTING  
CONVERGENCE ANGLE OF BACKSCATTERED BEAM SOUND,  
VELOCITY MEASUREMENT, ETC A66-32627
- LIGHT BACKSCATTERING EXPERIMENT IN LASER PROBING  
STUDIES OF ATMOSPHERIC LAYER ABOVE 100 KM  
NASA-CR-74730 N66-24998
- LASER SYSTEM FOR DETERMINING SKY BACKSCATTERING  
RADIATION - SUBSYSTEM CIRCUIT DIAGRAMS  
NASA-CR-80441 N67-13120
- BACKWARD WAVE OSCILLATOR**  
ARGON FM LASER, PARAMETRIC OSCILLATOR, AND  
BACKWARD WAVE OSCILLATOR DEVELOPMENT  
NASA-CR-81730 N67-18019
- BALANCE**  
LASER SYSTEM FOR DYNAMICALLY BALANCING GYRO ROTORS  
AND STATICALLY BALANCING ACCELEROMETERS  
NASA-CR-82449 N67-19130
- BALLISTIC RANGE**  
NANOSECOND PULSE LIGHT SOURCES USED IN FREE FLIGHT  
HYPERSONICS FOR BALLISTIC RANGE MEASUREMENTS,  
NOTING LESS PHOTOGRAPHIC BLURRING OF MOTION  
A67-18881
- BAND PASS FILTER**  
TWO-FREQUENCY VOLUME RESONATOR WITH INDEPENDENT  
TUNING WITHIN WIDE FREQUENCY BAND  
A67-11911
- BARIUM**  
LASER ACTION IN TRIPLY ACTIVATED BARIUM CROWN  
GLASS N66-28515
- BARRIER LAYER**  
CHANGE IN BASIC BARRIER RELATION FOR  
HETEROJUNCTION COMPARED TO HOMOJUNCTION OF WIDE  
GAP EMITTER INJECTION LASER A67-17097
- BE-C**  
RANGE MEASUREMENTS OF GEOS-I AND BE-C SATELLITES  
WITH RUBY LASER  
NASA-CR-77292 N66-34634

## BEACON SATELLITE

LASER REFLECTIONS FROM BEACON EXPLORER SATELLITE  
NASA-TM-X-57166 N67-18446

## BEAM COLUMN

SELF-FOCUSING OF LASER BEAM IN PLASMA, SOLVING WAVE EQUATION FOR SLAB AND CYLINDRICAL BEAM CONFIGURATIONS A67-12089

## BEAM SWITCHING

ATMOSPHERIC TURBULENCE EFFECTS ON LASER BEAM PROPAGATION, NOTING BEAM CROSS SECTION, PHASE VARIATION, AM AND FM, ETC A66-27035

LASER BEAM DEFLECTION AND SCANNING TECHNIQUES A66-42817

## BEARING

LASER BEAM EFFECT ON HYDRODYNAMIC BEARINGS, DISCUSSING MICROCRACKS AND CRITICAL ENERGY, EXPLAINING BREAKDOWNS A66-41409

## BENZENE

COUPLING OF ADJACENT AXIAL MODES IN EXTERNAL RAMAN RESONATOR OBSERVED AS FIRST STOKES FREQUENCY WITH BENZENE AS RAMAN MEDIUM AND Q-SWITCHED RUBY LASER AS PUMP SOURCE A66-39109

SECOND HARMONIC GENERATIONS AND MIXINGS OF RAMAN LINES PRODUCED IN CYCLOHEXANE, ACETONE, BENZENE AND CARBON DISULFIDE, PHOTOGRAPHING FIRST ORDER STOKES RADIATION A67-12052

LASER BEAM EFFECT ON BENZENE AND OTHER ORGANIC COMPOUNDS, NOTING FORMATION OF DARK READILY COAGULATING DEPOSIT A67-17028

## BERYLLIUM

ENERGY SPECTRA OF IONS EMITTED BY BERYLLIUM, CARBON AND MOLYBDENUM HEATED BY LASER A66-25479

TEMPERATURE MEASUREMENTS OF LASER SPARKS FROM RELATIVE INTENSITY OF X-RAY FLUX TRANSMITTED THROUGH BERYLLIUM FOILS OF DIFFERENT THICKNESS A66-40421

## BIBLIOGRAPHY

LASER BIBLIOGRAPHY JULY- DECEMBER 1965, INCLUDING REFERENCES TO HOLOGRAMS A66-39541

LASER MODEL OF N TWO-LEVEL SYSTEMS INTERACTING WITH RADIATION FIELD - BIBLIOGRAPHY AFRL-66-166 N66-29246

LASERS AND MASERS - BIBLIOGRAPHY AND ABSTRACTS NASA-SP-7009/01/ N66-35687

BIBLIOGRAPHY ON LASERS COVERING MODES, SCATTERING MECHANISMS, QUANTUM ELECTRODYNAMICS, MATTER-RADIATION INTERACTION, PLASMA, HOLOGRAPHY AND OPTICS A67-17890

## BIOLOGICAL EFFECT

OPTICAL RAY TRACING TO PREDICT FOCUSING CHARACTERISTICS OF LASER LIGHT IN REFRACTIVE TARGETS, CALCULATING HEATING EFFECTS IN TARGET, NOTING TARGET GEOMETRY, REFRACTIVE INDEX, THICKNESS OF SKIN LAYERS, ETC A66-25531

LASER SAFETY STANDARDS, DISCUSSING NATURE OF PHOTOBIOLOGICAL MECHANISMS RESPONSIBLE FOR TISSUE DAMAGE UPON EXPOSURE TO LASER RADIATION A66-27775

BIOLOGICAL EFFECTS AND DOSIMETRY OF ABSORBED RADIATION FROM RUBY LASER N66-37710

## BIREFRINGENCE

RESONANT BIREFRINGENCE IN POTASSIUM VAPOR UNDER INFLUENCE OF ELECTRIC FIELD OF RUBY LASER EMISSION A66-36066

LASER LIGHT MODULATION BY PCKELS OR KERR EFFECT FOR APPLICATION TO TELECOMMUNICATIONS SYSTEM, EXAMINING ELECTRICAL BIREFRINGENCE MODULATION A66-36262

SELF-TRAPPING OF LASER BEAM DUE TO DIFFRACTION FROM DIELECTRIC WAVEGUIDE ARISING FROM PERMITTIVITY INCREASE OF BIREFRINGENT BEAM A66-42554

## BIREFRINGENT COATING

LOSS MEASUREMENT FOR RUBY LASER RESONANT CAVITY, COMPARING THRESHOLDS FOR R SUB 1 AND R SUB 2 LINE OPERATION A67-16655

## BOGOLIUBOV THEORY

QUANTUM THEORY OF LASER MODEL, DERIVING KINETIC EQUATIONS FOR RADIATION AND SINGLE-PARTICLE DENSITY MATRICES, USING BOGOLIUBOV EXPANSION PROCEDURE A66-36008

## BOLOMETER

OUTPUT POWER OF CW LASER MEASURED BY WIRE BOLOMETER IN FORM OF PLANE SINGLE-LAYER SPIRAL AS SENSITIVE ELEMENT A66-35321

## BOSE-EINSTEIN STATISTICS

NEAR- BOSE- EINSTEIN PROBABILITY DISTRIBUTION OF PHOTOELECTRON COUNTS PRODUCED BY HE- NE GAS LASER NARROW BAND GAUSSIAN LIGHT SOURCE OPERATING SLIGHTLY BELOW OSCILLATION THRESHOLD A66-30645

## BOUNDARY VALUE

HIGH MAGNETIC FIELD EFFECT ON INTERBAND SEMICONDUCTOR LASER, PARTICULARLY ELECTROMAGNETIC MODES AND COUPLING AND THRESHOLD CURRENT CONDITIONS A67-16673

## BRAGG EQUATION

HORIZONTAL DEFLECTION IN TV DISPLAY PRODUCED BY BRAGG REFLECTION OF LASER LIGHT BY ULTRASONIC WAVES IN WATER A66-42816

## BRAIN INJURY

LOCALIZED DEEP BRAIN TISSUE LESIONS IN CATS BY LASER ENERGY A66-81895

## BREMSSTRAHLUNG

NONLINEAR DIELECTRIC LASER LIGHT ABSORPTION BY NEUTRAL GAS RESULTING IN AVALANCHE BREAKDOWN OF GAS DUE TO THERMAL IONIZATION A66-25425

EXPERIMENTAL EVIDENCE OF INVERSE BREMSSTRAHLUNG AND ELECTRON-IMPACT IONIZATION IN LOW PRESSURE ARGON IONIZED BY GIANT PULSE LASER A66-29115

MULTIPHOTON PROCESSES DUE TO LASER ACTION - CRITICAL INTENSITY CHARACTERISTICS, COMPTON SCATTERING, BREMSSTRAHLUNG, PHOTOELECTRIC EFFECT, AND ELIMINATION OF INFRARED DIVERGENCE CEA-R-2888 N66-29032

## BRIGHTNESS

INITIAL PULSE IN LUMINOUS EMISSION OF DISCHARGE LASER, USING PHOTOMULTIPLIER PRECEDED BY MOBILE IRIS, DETERMINING GEOMETRICAL DISTRIBUTION OF DISCHARGE BRIGHTNESS A66-31209

LASER BRIGHTNESS GAIN AND SINGLE TRANSVERSE MODE OPERATION BY COMPENSATION FOR THERMAL DISTORTION WITH EXTERNAL MIRROR A67-16656

EXTERNAL MIRROR FOR LASER BRIGHTNESS GAIN AND THERMAL COMPENSATING MODE CONTROL N67-16954

## BRIGHTNESS DISCRIMINATION

RUBY PHOSPHORESCENCE UNDER INTENSE OPTICAL EXCITATION, INFERRING POSSIBLE RECOMBINATION CHARACTERISTICS FROM INITIAL BRIGHTNESS DECAY A66-28607

## BRILLOUIN EFFECT

COUPLED WAVE FORMALISM, GIVING UNIFIED DESCRIPTION OF PARAMETRIC DOWN CONVERSION OF LIGHT, STIMULATED BRILLOUIN AND RAMAN EFFECTS, ETC, STRESSING EXPONENTIAL CHARACTER OF GAIN A66-26156

DISCREPANCY BETWEEN CALCULATED AND EXPERIMENTAL VALUES FOR RAMAN GAIN IN PULSED LASER SUGGESTS HIGHER ENERGY DISTRIBUTION DUE TO LIGHT TRAPPING OR BRILLOUIN SCATTERING A66-26157

- INTERACTION BETWEEN STIMULATED BRILLOUIN AND RAMAN SCATTERING IN CARBON SULFIDE, USING OPTICAL RESONATOR AND LASER BEAM A66-26162
- MULTIPLE STIMULATED BRILLOUIN EMISSION EXHIBITED BY LIQUIDS EXPOSED TO PULSED RUBY LASER, NOTING SCATTERING EVENTS, STOKES ORDERS IDENTIFICATION AND ITERATION MECHANISM A66-26164
- STIMULATED BRILLOUIN SCATTERING IN QUARTZ ANALYZED, NOTING AMPLIFICATION, STOKES WAVE GENERATION AND RUBY GAIN A66-26165
- STIMULATED BRILLOUIN SCATTERING FROM NITROGEN AND METHANE USING GIANT PULSE LASER, NOTING CONVERGENCE ANGLE OF BACKSCATTERED BEAM SOUND, VELOCITY MEASUREMENT, ETC A66-32627
- BRILLOUIN SPECTRA OF ACETONE, ETHYL ALCOHOL, WATER, CARBON BISULFIDE, TOLUENE, AND CARBON TETRACHLORIDE USING HELIUM-NEON LASER AND PHOTOELECTRIC DETECTION N66-35529
- STIMULATED BRILLOUIN EFFECT IN HIGH PRESSURE GASEOUS NITROGEN, METHANE, AND CARBON DIOXIDE USING GIANT PULSE LASER N66-35533
- HYPERSONIC EXCITATIONS DUE TO BRILLOUIN SCATTERING FOR CASE WITH STOKES FEEDBACK, DERIVING QUANTUM EQUATION OF MOTION FOR CREATION OF LASER AND STOKES MODES AND COUPLED ACOUSTIC MODE A67-16683
- OPTICAL HETERODYNE TECHNIQUE DETECTING STIMULATED BRILLOUIN SCATTERING, NOTING FREQUENCY SHIFT DEMODULATION ARISING FROM RUBY LASER LIGHT INCIDENCE ON QUARTZ CRYSTAL A67-16688
- BUBBLE**
- BUBBLE GROWTH PARAMETERS IN SATURATED AND SUBCOOLED NUCLEATE BOILING AND ANALYSIS OF SINGLE BUBBLE GENERATED BY USING LASER BEAM ON THERMOCOUPLE OR FLAT PLAT SUBMERGED IN WATER NASA-CR-81673 N67-17962

- BURN INJURY**
- VISUAL ACUITY DECUREMENT FROM LASER LESION IN FOVEA OF STUMP TAIL MACAQUE MONKEYS A67-16287

## C

- CADMIUM**
- LASER SATURATION OF PHOTOCONDUCTIVITY AND DETERMINATION OF IMPERFECTION PARAMETERS IN SENSITIVE PHOTOCONDUCTORS SUCH AS SINGLE CRYSTAL OF CADMIUM A67-11879
- CADMIUM ALLOY**
- SEMICONDUCTOR LASERS WITH HIGH POWER EFFICIENCY OBTAINED VIA ELECTRON BEAM EXCITATION ON CRYSTALS OF MIXED CADMIUM-SULFIDE-SELENIDE ALLOY A66-31533
- CADMIUM COMPOUND**
- SEMICONDUCTOR LASERS USING SINGLE AND DOUBLE PHOTON OPTICAL EXCITATION A67-18930
- CADMIUM FLUORIDE**
- EFFECT OF ANOMALOUS DISPERSION ON STIMULATED EMISSION SPECTRUM OF DOPED CADMIUM FLUORIDE CRYSTALS A66-32317
- LASER REGIME WITH GIANT PULSES GENERATED IN DYSPROSIUM DOPED CADMIUM FLUORIDE UNDER CONTINUOUS PUMPING BY XENON LAMPS, OBTAINING Q FACTOR MODULATION BY ROTATING PRISM A66-34178
- CADMIUM SELENIDE**
- LASER OSCILLATIONS IN CD SE AND CD S BOMBARDED BY FAST ELECTRON BEAM A66-27031
- LASER-GENERATION-TYPE LUMINESCENCE CD S- CD SE CRYSTALS EXPOSED TO DOUBLE PHOTON EXCITATION FROM RUBY LASER A66-27647
- FORCED EMISSION FROM ELECTRON-EXCITED CADMIUM SELENIDE A66-35788
- SPECTRAL CHARACTERISTICS OF TWO-PHOTON OPTICAL

- EXCITATION AND LIGHT EMISSION FROM CD SE SEMICONDUCTOR LASER WITH MODULATED Q-FACTOR A66-37565

- OPTICAL PUMPING WITH DIODE LASER INTO FABRY-PEROT RESONATOR FACE OF THIN HIGHLY-ABSORBING SEMICONDUCTOR, NOTING VARIABLE MODE SPACING INCLUDING SINGLE MODE OUTPUT A67-10879

- SPECTRAL CHARACTERISTICS OF TWO-PHOTON OPTICAL EXCITATION AND LIGHT EMISSION FROM CD SE SEMICONDUCTOR LASER WITH MODULATED Q-FACTOR A67-15299

- INTERNAL MODULATION OF IR GAS LASER USING CADMIUM SULFIDE OR SELENIDE SINGLE CRYSTALS A67-16914

**CADMIUM SULFIDE**

- LASER OSCILLATIONS IN CD SE AND CD S BOMBARDED BY FAST ELECTRON BEAM A66-27031

- CD S SINGLE CRYSTAL OPTICAL GENERATOR DURING EXCITATION BY RUBY LASER, DISCUSSING TWO-PHOTON ABSORPTION COEFFICIENT AT 300 DEGREES K FOR RADIATION FLUX DENSITIES A66-27576

- LASER-GENERATION-TYPE LUMINESCENCE CD S- CD SE CRYSTALS EXPOSED TO DOUBLE PHOTON EXCITATION FROM RUBY LASER A66-27647

- LINEAR ABSORPTION EFFECT ON THRESHOLD FOR SELF-FOCUSING OF LASER BEAM IN CADMIUM SULFIDE, NOTING VARIATION OF ABSORPTION COEFFICIENT A66-31537

- GENERATION IN CADMIUM SULFIDE DURING TWO-PHOTON OPTICAL EXCITATION BY RUBY LASER WITH MODULATED Q-FACTOR A66-33134

- MODULATION BY ULTRASONIC DIFFRACTION OF 10.6 MICRON LASER RADIATION IN PHOTOELASTIC CD S, GA AS AND SI CRYSTALS A66-39112

- PHOTOCONDUCTIVE AND LUMINESCENT BEHAVIOR OF UNDOPED CADMIUM SULFIDE SINGLE CRYSTALS AT ROOM TEMPERATURE UNDER LASER EXCITATION A66-39165

- LASER INDUCED PHOTOCONDUCTIVITY IN CADMIUM SULFIDE SINGLE CRYSTALS REPT.-661 N66-37870

- LASER EMISSION IN PURE CADMIUM SULFIDE CRYSTALS BOMBARDED BY ELECTRON BEAMS A67-12812

- OSCILLATION IN CD S CRYSTAL BY RUBY LASER INDUCED TWO-PHOTON EXCITATION, NOTING PROPORTIONALITY OF ABSORPTION COEFFICIENT TO LIGHT BEAM INTENSITY A67-16667

- INTERNAL MODULATION OF IR GAS LASER USING CADMIUM SULFIDE OR SELENIDE SINGLE CRYSTALS A67-16914

- FAR FIELD PATTERN OF SHEET-LIKE LASER BEAM FROM ELECTRON BOMBARDED CD S AND ZN O SINGLE CRYSTALS A67-19798

- LASING POTENTIALS OF COMPOUNDS PREPARED FROM ELEMENTS OF GROUP II AND GROUP IV IN PERIODIC TABLE N67-16953

**CADMIUM TELLURIDE**

- SPONTANEOUS AND COHERENT PHOTOLUMINESCENCE IN CADMIUM MERCURY TELLURIDE CRYSTALS EXCITED OPTICALLY BY GA AS DIODE LASER A66-29390

- SEMICONDUCTOR LASERS AND FAST IR DETECTORS, DISCUSSING IN AS, IN SB AND THREE TYPES OF MERCURY CADMIUM TELLURIDE DETECTORS A67-16668

**CALCIUM FLUORIDE**

- MAGNETIZATION INDUCED BY CIRCULARLY POLARIZED LASER LIGHT INCIDENT ON NONABSORBING MATERIAL, IN ABSENCE OF EXTERNAL MAGNETIC FIELD, IN DOPED CALCIUM FLUORIDE PROPORTIONAL TO LIGHT INTENSITY

- AND VERDET CONSTANT A66-26142
- STIMULATED EMISSION FROM SAMARIUM-DOPED CALCIUM FLUORIDE CRYSTAL EXCITED BY RUBY LASER A66-29358
- LASER LINES DUE TO ENERGY TRANSFER FROM COLOR CENTERS TO ERBIUM IONS IN CALCIUM FLUORIDE CRYSTALS IRRADIATED BY GAMMA RAY A66-30278
- SOLID STATE CW OPTICALLY PUMPED MICROWAVE MASER, USING DIVALENT THULIUM DOPED CALCIUM FLUORIDE A66-33614
- STIMULATED EMISSION FROM SAMARIUM-DOPED CALCIUM FLUORIDE CRYSTAL EXCITED BY RUBY LASER A66-37362
- RUBY LASER RADIATION EFFECT ON FLUORESCENCE AND LASER ACTION IN DYSPROSIUM DOPED CALCIUM FLUORIDE CRYSTALS A66-37656
- DIVALENCE SAMARIUM ION DOPED CALCIUM FLUORIDE LASER ACTION AT LOW TEMPERATURES OBTAINED WITH GIANT PULSE RUBY LASER EXCITATION A67-16661
- DYSPROSIUM DOPED CALCIUM FLUORIDE GIANT PULSE LASER WITH HIGH REPETITION RATE OBTAINED, USING DC PUMPING XENON LAMP A67-16674
- CALCIUM FLUORIDE-CERIUM FLUORIDE WITH NEODYMIUM ADDITIONS AS ACTIVE MEDIUM FOR LASERS, DISCUSSING ABSORPTION AND LUMINESCENCE SPECTRA AND INDUCED RADIATION A67-16922
- CALCIUM TUNGSTATE**  
ETCHING METHODS TO VISUALIZE LATTICE DISLOCATIONS AND GRAIN BOUNDARIES IN CZOCHRALSKI GROWN CALCIUM TUNGSTATE CRYSTALS DOPED WITH NEODYMIUM FOR LASER APPLICATION A67-19565
- CALIBRATION**  
QUANTITATIVE PHOTOGRAPHIC DETERMINATIONS OF LASER BEAM POWER DENSITY DISTRIBUTIONS AND Q-SWITCHED RUBY OSCILLATOR-AMPLIFIER SYSTEM DIVERGENCE CHARACTERISTICS A66-41032
- LASER PULSE ENERGY MEASUREMENTS WITH LIQUID ABSORPTION CELL CALORIMETER A67-15456
- CALIBRATOR**  
LASER ACCELERATOR CALIBRATOR AS STANDARD FOR VIBRATION DISPLACEMENT MEASUREMENTS N66-28461
- CALORIMETER**  
ENERGY AND POWER OF Q-SWITCHED NEODYMIUM GLASS LASER MEASURED, USING CALORIMETRIC DEVICES, VACUUM PHOTODIODES, ETC A66-34904
- NICKEL-COPPER CONE CALORIMETER DESIGN AND FABRICATION FOR LASER ENERGY MEASUREMENTS A67-10193
- CALORIMETER USING ENAMELED COPPER WIRE WITH VARIABLE RESISTANCE FOR MEASURING LASER ENERGY AND OUTPUT POWER A67-13536
- LASER PULSE ENERGY MEASUREMENTS WITH LIQUID ABSORPTION CELL CALORIMETER A67-15456
- CAMERA**  
PHOTOGRAPHIC RADAR SYSTEM EMPLOYING Q-SWITCHED RUBY LASER, MULLARD TYPE 6929 IMAGE TUBE AND CONVENTIONAL CAMERA A66-38796
- CAPTURE EFFECT**  
TRAVELING WAVE BEATS CREATED BY RING LASER ON ROTATING PLATFORM, NOTING FREQUENCY DIVISION ROTATING RATE AND CAPTURE BAND PARAMETERS A66-25102
- TRAVELING WAVE BEATS CREATED BY RING LASER ON ROTATING PLATFORM, NOTING FREQUENCY DIVISION ROTATING RATE AND CAPTURE BAND PARAMETERS A66-30281
- OPTICAL HETERODYNE RECEIVER ANTENNA PROPERTIES, NOTING EFFECTIVE APERTURE OF CAPTURE CROSS SECTION VS DIRECTIONAL TOLERANCE AND DETECTION OF DOPPLER SHIFTS IN LIQUID SCATTERED COHERENT LIGHT A66-42809
- CARBON**  
ENERGY SPECTRA OF IONS EMITTED BY BERYLLIUM, CARBON AND MOLYBDENUM HEATED BY LASER A66-25479
- ELECTRON DENSITY, OPTICAL THICKNESS AND TEMPERATURE OF RUBY LASER-INDUCED CARBON PLASMA A67-16654
- CARBON DIOXIDE**  
I R LASER RADIATION WITH POWER OF 5.7 WATTS IN VICINITY OF 10.69 MU IN SEALED TUBE CONTAINING PURE CARBON DIOXIDE EXCITED BY AC OR DC CURRENT A66-25410
- HE- NE LASER HOMODYNE SPECTROMETER OBSERVATION OF BROADENING OF SPECTRAL PROFILE OF LIGHT SCATTERED FROM CARBON DIOXIDE NEAR CRITICAL TEMPERATURE AND DENSITY DUE TO DENSITY FLUCTUATIONS A66-26168
- VIBRATIONAL-ROTATIONAL LINE STRENGTHS AND WIDTHS IN CARBON DIOXIDE, USING CARBON DIOXIDE-NEON LASER A66-27030
- MEASUREMENT OF SINGLE LINE IN P BRANCH OF CARBON DIOXIDE VIBRO-ROTATIONAL ABSORPTION BAND USING TUNED OPTICAL MASER SPECTROSCOPY, NOTING PRESENCE OF SHIFTED FREQUENCIES A66-28691
- CARBON DIOXIDE LASER PRINCIPLE AND PERFORMANCE A66-33247
- HIGH-POWER MOLECULAR LASER BASED ON VIBRATIONAL-ROTATIONAL ENERGY LEVEL, NOTING CARBON DIOXIDE-NEON-HELIUM LASER DESIGN A66-33248
- LASER ACTION IN CLOSED MOLECULAR SYSTEM WITH MIXTURE OF CARBON DIOXIDE, NITROGEN AND WATER VAPOR, NOTING COUPLING-OUT PLATE REFLECTIVITY AND POPULATION INVERSION A66-35433
- IDENTIFICATION OF NUMBER OF LINES AT 11 MICRONS EMITTED FROM PULSED CARBON DIOXIDE LASER AS P BRANCH OF CARBON DIOXIDE VIBRATIONAL TRANSITION A66-37629
- COMPETITION, HYSTERESIS AND REACTIVE Q-SWITCHING IN CARBON DIOXIDE LASERS AT 10.6 MICRONS, USING MOVING MIRROR TECHNIQUE A66-41631
- CONDUCTIVITY MODULATION BY HEAVY-TO-LIGHT HOLE TRANSITIONS IN P-TYPE GERMANIUM NOTING CARRIER LIFETIME AND RINGING OF LASER PULSE A66-42249
- NITROGEN-CARBON DIOXIDE 10.6 MICRON LASER FOR OPTICAL TRACKING SYSTEM N66-31161
- STIMULATED BRILLOUIN EFFECT IN HIGH PRESSURE GASEOUS NITROGEN, METHANE, AND CARBON DIOXIDE USING GIANT PULSE LASER N66-35533
- OPTIMIZATION OF HIGH-POWER CONTINUOUS-WAVE GAS LASER HAVING CARBON DIOXIDE, NITROGEN, AND HELIUM MIXTURE AS ACTIVE MEDIUM N66-38449
- INEXPENSIVE CARBON DIOXIDE MOLECULAR GAS LASER USING PLANO-CONCAVE EYEGLASS LENSES A67-10827
- RADIATIVE TRANSITION PROBABILITIES BETWEEN LASER VIBRATIONAL LEVELS OF CARBON DIOXIDE, NOTING RELAXATION TIME AND DIPOLE MOMENT A67-11891
- POPULATION INVERSION OF UPPER LASER LEVEL OF CARBON DIOXIDE MOLECULES, NOTING ELECTRON-MOLECULE COLLISION AND EFFECT OF NEON ADDITION A67-13297
- SELF-MODULATION CHARACTERISTICS OF CARBON DIOXIDE

- LASER AND USE IN MEASURING DETECTOR RESPONSE AND ATMOSPHERIC PROPAGATION CHARACTERISTICS  
A67-14399
- POPULATION INVERSION OF UPPER LASER LEVEL OF CARBON DIOXIDE MOLECULES, NOTING ELECTRON-MOLECULE COLLISION AND EFFECT OF NEON ADDITION  
A67-14722
- TUBE DIAMETER INFLUENCE ON OUTPUT POWER AND EFFICIENCY OF GAS LASER  
A67-16629
- MOLECULAR GAS LASER Q-SWITCHING TECHNIQUES, DETERMINING ROTATIONAL COLLISION SECTIONS FOR CARBON DIOXIDE AND CROSS SECTIONS FOR VIBRATIONAL RELAXATION  
A67-16632
- DOUBLE PROBE AND MICROWAVE RESONANCE MEASUREMENTS OF GAS ADDITIVES EFFECT ON RADIAL VARIATION OF ELECTRON TEMPERATURE AND DENSITY WITH PARTIAL PRESSURES IN CARBON DIOXIDE-NITROGEN-HELIUM GAS LASER  
A67-17274
- THERMALLY EXCITED INFRARED BEAM LASER USING CARBON DIOXIDE, NITROGEN OXIDE, AND HYDROCYANIC ACID MOLECULAR ENERGY LEVELS  
ATD-66-102 N67-15769
- DISCHARGE TUBE DIMENSIONS, FLOW RATE, WALL TEMPERATURE, AND GAS MIXTURES DEFINED FOR CARBON DIOXIDE GAS LASER  
NASA-CR-81332 N67-16633
- CARBON DISULFIDE**  
INTERACTION BETWEEN STIMULATED BRILLOUIN AND RAMAN SCATTERING IN CARBON SULFIDE, USING OPTICAL RESONATOR AND LASER BEAM  
A66-26162
- LASER OSCILLATION IN FLASH PHOTOLYSIS OF CARBON DISULPHIDE AND OXYGEN TO FORM CO  
A66-31941
- CARBON MONOXIDE**  
LASER OSCILLATION IN FLASH PHOTOLYSIS OF CARBON DISULPHIDE AND OXYGEN TO FORM CO  
A66-31941
- CARBON TETRACHLORIDE**  
C W HE- NE LASER COMPARED WITH MERCURY ARC SOURCE, OBTAINING RAMAN SPECTRA OF CARBON TETRACHLORIDE BY THREE METHODS OF EXCITATION  
A67-13912
- CARRIER**  
EXCITATION OF AXIAL OSCILLATION MODES IN SEMICONDUCTOR LASERS ANALYZED, BASED ON RATE EQUATIONS FOR CHEMICAL POTENTIALS OF CARRIERS AND NUMBER OF PHOTONS  
A66-37687
- OPTICAL NONLINEARITIES DUE TO CONDUCTION BAND ELECTRONS IN IN AS, IN SB, GA AS AND PB TE STUDIED, USING Q-SWITCHED CARBON DIOXIDE LASER RADIATION  
A67-12524
- OPTICAL MIXING DUE TO CONDUCTION BAND ELECTRONS IN SEMICONDUCTOR  
A67-12525
- CARRIER INJECTION**  
CURRENT INJECTION EFFECT ON TIME DELAY OF GA AS LASER RADIATION  
A67-10083
- CARRIER MODULATION**  
COHERENT TRANSMISSION OF OPTICAL RADAR FROM LASER SOURCE AND USE OF RF SUBCARRIERS PLACED ON OPTICAL BEAMS FOR WIDEBAND COMMUNICATIONS PURPOSES  
A66-28404
- CONDUCTIVITY MODULATION BY HEAVY-TO-LIGHT HOLE TRANSITIONS IN P-TYPE GERMANIUM NOTING CARRIER LIFETIME AND RINGING OF LASER PULSE  
A66-42249
- CASCADE**  
UPPER LASER STATES DERIVING POPULATION THROUGH CASCADE TRANSITIONS FROM HIGHER LAYER STATES OF ARGON ION NOTING CONSISTENCY OF LASER OUTPUT CURRENT DEPENDENCE WITH CURRENT DEPENDENCE OF CASCADE RATE  
A66-37774
- CASSEGRAIN OPTICS**  
SUN PUMPED CONTINUOUS WAVE ONE-WATT YAG CRYSTAL LASER, NOTING EQUIPMENT SETUP AND OUTPUT DURATION  
A66-32620
- CAT**  
CHORIORETINAL LESION PRODUCED BY PULSED RUBY LASER BEAM AND COMPLEX CHANGES IN RETINAL EXCITABILITY IN CATS  
A66-31761
- LASER LESIONS-CHANGES IN RETINAL EXCITABILITY IN CATS  
A66-81614
- LOCALIZED DEEP BRAIN TISSUE LESIONS IN CATS BY LASER ENERGY  
A66-81895
- CATHODE**  
RELATION BETWEEN LASER PARAMETERS AND CATHODE DIAMETER IN EXCITATION OF HE- NE MIXTURE BY DISCHARGE OF HOLLOW CYLINDER  
A66-29357
- RELATION BETWEEN LASER PARAMETERS AND CATHODE DIAMETER IN EXCITATION OF HE- NE MIXTURE BY DISCHARGE OF HOLLOW CYLINDER  
A66-37361
- CATHODE RAY TUBE**  
ELECTRON-BEAM-CONTROLLED CRT SCANLASER  
A66-25557
- CATION**  
POSITIVE ION EMISSION FROM TUNGSTEN SURFACES LASER IRRADIATED STUDIED, USING TIME-OF-FLIGHT SPECTROMETER  
A67-16651
- CAVITY**  
MULTIMODE OSCILLATIONS OF SOLID STATE LASER UNDER STATIONARY CONDITIONS EXTENDED TO TREAT CAVITIES WITH LOSSY END MIRRORS OR WITH FREQUENCY DEPENDENT LOSSES  
AFCRL-66-384 N66-33524
- FARADAY ROTATORS FOR HIGH POWER LASER CAVITIES  
N66-36914
- CAVITY RESONANCE**  
LASER MIRROR TRANSDUCER DECOUPLING FROM MECHANICAL RESONANCES OF LASER CAVITY  
A66-35813
- MATHEMATICAL DEVELOPMENT OF RESONANT FREQUENCIES OF ELECTROMAGNETIC CAVITY - EVALUATION OF OPTICAL MASER PHOTON RATE GYROSCOPE  
NASA-CR-59809 N66-33411
- CAVITY RESONATOR**  
FARADAY ROTATION OBTAINED WITH PULSED HIGH-FIELD MAGNETS FOR CONTROLLING LASER CAVITIES  
A66-35380
- THEORY OF STEADY MULTIMODE OSCILLATION OF SOLID STATE LASER EXTENDED TO CAVITIES WITH INEFFICIENT END MIRRORS OR LOSSES DEPENDENT ON FREQUENCY  
A66-41274
- INTRINSIC NOISE TEMPERATURE MEASUREMENT IN REFLECTION TYPE CAVITY MASER  
A67-17892
- CEREBRAL CORTEX**  
CEREBRAL CORTEX OF DOG AS AFFECTED BY LASER RADIATION  
A66-82035
- CERIUM COMPOUND**  
CALCIUM FLUORIDE-CERIUM FLUORIDE WITH NEODYMIUM ADDITIONS AS ACTIVE MEDIUM FOR LASERS, DISCUSSING ABSORPTION AND LUMINESCENCE SPECTRA AND INDUCED RADIATION  
A67-16922
- CESIUM DIODE**  
TIME RESOLUTION OF LASER-INDUCED ELECTRON EMISSION FROM CESIUM DIODE AT HIGH LASER POWER  
A66-31135
- CESIUM PLASMA**  
ATOMIC TIME STANDARDS, DESCRIBING CESIUM BEAM STANDARD, AMMONIA MASER AND GAS-CELL TYPE CLOCKS  
A66-35468
- CESIUM VAPOR**  
CESIUM VAPOR USED FOR TRANSFORMER LASER TO BE OPTICALLY PUMPED BY BATTERY OF NEODYMIUM LASERS

- GPL-A-31-3 N66-33813
- CHARGED PARTICLE**  
 STRONG AXIAL MAGNETIC FIELD EFFECT ON CONSTANT CURRENT DISCHARGE IN CONTINUOUS-DUTY ION LASER, NOTING PLASMA DIFFUSION, CHARGED PARTICLE DENSITY AND LASER OUTPUT DECREASE A66-33117
- ELECTRON-ION EMISSION PATTERN DISTRIBUTION OBTAINED BY PULSED LASER FOCUSING ON SOLID TARGET A66-33256
- CHARGED PARTICLE MOTION IN MAGNETIC FIELD UNDER ACTION OF LASER EMISSION A67-18787
- CHARGED PARTICLES FOR LASING, DISCUSSING MANUFACTURE OF ARGON LASER A67-19083
- CHELATE COMPOUND**  
 DEUTERIUM ISOTOPE EFFECT ON THRESHOLDS OF EUROPIUM CHELATE LASERS, NOTING SOLVENT THERMAL EFFECTS A66-26598
- ORGANIC LASER SYSTEMS INCLUDING LUMINESCENCE FOR ACHIEVING LASER ACTION, FLUORESCENT AND PHOSPHORESCENT SYSTEMS AND CHEMISTRY AND SPECTROSCOPIC PROPERTIES OF RARE EARTH CHELATES A66-36970
- FLUORESCENCE QUANTUM EFFICIENCIES OF OCTA-COORDINATED EUROPIUM HOMOGENEOUS AND MIXED CHELATES IN ORGANIC SOLVENTS, NOTING EFFECT OF OXYGEN REMOVAL A66-41153
- SPECTROSCOPIC, CHEMICAL AND LASER PROPERTIES OF PIPERIDINIUM SALT OF EUROPIUM TETRAKIS A66-43034
- PHYSICAL PROPERTIES AND OPERATING CHARACTERISTICS OF EUROPIUM AND RARE EARTH CHELATE LASERS TR-66-052.13 N67-12533
- CHEMICAL ANALYSIS**  
 LASER MICROPROBE AS EXCITATION SOURCE FOR EMISSION SPECTROCHEMICAL ANALYSIS AFCL-65-855/1/ N66-29249
- SPECTROCHEMICAL ANALYSIS OF SOLID SPECIMEN FROM VAPOR FORMED BY LASER BEAM AND EXCITED BY SPARK DISCHARGE A67-16786
- CHEMICAL EXPLOSION**  
 Q-SWITCHED RUBY LASER USED TO EXPLODE PSEUDO-AIR TARGETS NOLTR-65-152 N66-29965
- CHEMICAL LASER**  
 SELF-PUMPING CHEMICAL LASER THEORY AND OPERATION, NOTING CHEMICAL PUMPING A66-26382
- DEUTERIUM ISOTOPE EFFECT ON THRESHOLDS OF EUROPIUM CHELATE LASERS, NOTING SOLVENT THERMAL EFFECTS A66-26598
- CHEMICAL PUMPED UV LASER ACTION THROUGH THERMAL DECOMPOSITION OF DIMETHYL PEROXIDE A66-28836
- LASER OSCILLATION IN FLASH PHOTOLYSIS OF CARBON DISULPHIDE AND OXYGEN TO FORM CO A66-31941
- LIGHT ENERGY MEASUREMENTS MADE WITH ARGON BOMB USED AS CHEMICALLY POWERED LASER PUMP A66-35388
- FLUORESCENCE QUANTUM EFFICIENCIES OF OCTA-COORDINATED EUROPIUM HOMOGENEOUS AND MIXED CHELATES IN ORGANIC SOLVENTS, NOTING EFFECT OF OXYGEN REMOVAL A66-41153
- C W LASER ACTION IN HOLMIUM-DOPED ERBIUM TRIOXIDE WITH DOMINANT PUMPING BY ENERGY TRANSFER BETWEEN IONS A66-42555
- INJECTION LASER COOLING BY REMOVAL OF HEAT FROM ENVIRONMENT FOR CONVERSION TO LIGHT NASA-CR-76761 N66-32437
- APPARATUS FOR GENERATION OF INFRARED AND FAR INFRARED NEW LASER LINES NASA-CR-80090 N67-12260
- OPTO-ELECTRONIC AIRCRAFT ALTIMETER CONCEPT BASED ON PROPERTIES OF ELECTRON INJECTION LASERS AND SILICON PHOTODIODES N67-13079
- HIGH CURRENT SOLID STATE PULSER USED TO DRIVE INJECTION LASER FOR ROOM TEMPERATURE OPERATION ECOM-2753 N67-15343
- LASING POTENTIALS OF COMPOUNDS PREPARED FROM ELEMENTS OF GROUP II AND GROUP IV IN PERIODIC TABLE N67-16953
- CHEMICAL PROPERTY**  
 SPECTROSCOPIC, CHEMICAL AND LASER PROPERTIES OF PIPERIDINIUM SALT OF EUROPIUM TETRAKIS A66-43034
- CHEMICAL REACTION**  
 Q-SWITCH PULSED RUBY LASER IRRADIATION-INDUCED CHEMICAL DISSOCIATION AND IONIZATION IN RESIDUAL GASES A66-42076
- CHEMILUMINESCENCE**  
 UNFOCUSED RUBY LASER RADIATION FIELD-BIPHENYL COMPOUND INTERACTION, RESULTING LUMINESCENCE AND APPARENT MULTIPHOTON ABSORPTION A66-38528
- CHLORINE**  
 THREE NEW VISIBLE CW LASER LINES IN DISCHARGE IN SINGLY-IONIZED CL A67-10373
- CHROMIUM**  
 L-BAND TRAVELING WAVE MASER USING CHROMIUM DOPED RUTILE, DISCUSSING INVERTED SUSCEPTIBILITY AS FIGURE OF MERIT A66-38239
- CONCENTRATION OF CHROMIUM IONS IN RUBY LASER CRYSTAL LATTICE DETERMINED FROM RADIATION OUTPUT CHARACTERISTICS N66-37712
- CHROMIUM COMPOUND**  
 INVERTED SUSCEPTIBILITY, INVERSION RATIO, LINE WIDTHS AND SPIN-LATTICE RELAXATION TIMES FOR MASER OPERATION POINT IN CHROMIUM-DOPED COBALT POTASSIUM CYANATE A66-30934
- CHROMOSOME**  
 PHYSICS LECTURE SUMMARIES INCLUDING LASER BEAMS, ELECTRON SCATTERING, PARAMAGNETIC RESONANCE, PARTICLE ABSORPTION, CHROMOSOMES, AND RELATIVITY ISS-66/19 N66-35043
- CINEMATOGRAPHY**  
 AEROSPACE TECHNOLOGY RESEARCH IN U.S.S.R. - LASER ACTION BY SUPERCOOLED PLASMA, LITHIUM CRYSTAL GROWTH, METALLOSILOXANE POLYMER SYNTHESIS AND SPACE TECHNOLOGY CINEMATOGRAPHY N66-32699
- CIRCUIT**  
 LASER SYSTEM FOR DETERMINING SKY BACKSCATTERING RADIATION - SUBSYSTEM CIRCUIT DIAGRAMS NASA-CR-80441 N67-13120
- HIGH CURRENT SOLID STATE PULSER USED TO DRIVE INJECTION LASER FOR ROOM TEMPERATURE OPERATION ECOM-2753 N67-15343
- CIRCULAR POLARIZATION**  
 LINEARLY AND CIRCULARLY POLARIZED FIELDS IN LASER AMPLIFIER INTERACTION WITH AXIAL MAGNETIC FIELD, EMPHASIZING COMBINATION TONE PRODUCTION A66-41624
- LASER OPERATION ON CIRCULARLY POLARIZED MODE AFOSR-66-2679 N67-17274
- CIRCULARLY POLARIZED LASER MODES IN RUBY LASER MATERIAL N67-17277
- CLADDING**  
 PASSIVE CORE FIBER LASER DOES NOT REMOVE COMPLETELY NEED FOR OPTICAL QUALITY IN CLADDING MATERIAL A67-16666

## CLEAR AIR TURBULENCE

LIGHT DETECTION AND RANGING / LIDAR/ TECHNIQUE USE  
IN ATMOSPHERIC RESEARCH, PARTICULARLY  
METEOROLOGICAL FACTORS IMPORTANT TO AVIATION AND  
ROCKET OPERATIONS  
AIAA PAPER 65-464 A66-27892

MEASUREMENTS OF MASER BEAM PROPAGATED THROUGH  
ATMOSPHERE, EMPHASIZING BEAM BROADENING AND SIGNAL  
FLUCTUATION DUE TO CLEAR AIR TURBULENCE A66-28581

C AT DETECTION FROM DOPPLER SHIFT IN LASER LIGHT  
BACKSCATTERED FROM ATMOSPHERIC AEROSOL A66-28930

DOPPLER LASER RADAR SYSTEM FOR DETECTION OF CLEAR  
AIR TURBULENCE A66-35122  
SID-66-450

LASER OPTICAL RADAR USED FOR CLEAR AIR TURBULENCE  
DETECTION A66-38204  
AFCRL-66-115

OUTPUT CHARACTERISTICS OF HALF-WAVE MODE KERR  
CELL RUBY OSCILLATOR USED AS OPTICAL RADAR FOR  
CLEAR AIR TURBULENCE / CAT/ DETECTION A67-12053

CLEAR AIR TURBULENCE DETECTION WITH LASER RADAR,  
NOTING AIRBORNE EQUIPMENT AND RESULTS A67-15304

## CLEAVAGE

CLEAVAGE AND SEPARATION OF DYE-DOPED ICE AND  
PARAFFIN INSTANTANEOUSLY HEATED BY LASER PULSE,  
MEASURING MECHANICAL PULSE AT ENERGY  
CONCENTRATIONS BELOW VAPORIZATION HEAT A67-18807

## CLOSED CIRCUIT TELEVISION

LASER SYSTEM FOR DIAMOND PIERCING IN WIRE-DRAWING  
DIES AND CLOSED CIRCUIT TV VIEWING SYSTEM FOR  
MONITORING OPERATION A67-15309

## CLOSED CYCLE

DUAL CHANNEL TRAVELING WAVE MASER FOR INTEGRATION  
IN CLOSED CYCLE REFRIGERATOR A67-15908

## CLOUD COVER

CIRRUS CLOUD COVER OBSERVATION CAPABILITY AND  
PERFORMANCE SPECIFICATIONS FOR METEOROLOGICAL  
SATELLITE LIDAR A66-29977  
NASA-CR-76087

## COATING

GALLIUM ARSENIDE LASER OUTPUT INCREASE DUE TO  
ALUMINUM EVAPORATED COATING ON SILICON DIOXIDE  
USED AS REFLECTIVE COATING A67-19794

## COBALT

MOLECULAR SPECTROSCOPY OF ILLUMINATION EFFECTS ON  
COBALT ACTIVATED ZN S EXPOSED TO RUBY LASER  
PULSES A67-10683

## COBALT COMPOUND

INVERTED SUSCEPTIBILITY, INVERSION RATIO, LINE  
WIDTHS AND SPIN-LATTICE RELAXATION TIMES FOR MASER  
OPERATION POINT IN CHROMIUM-DOPED COBALT POTASSIUM  
CYANATE A66-30934

## COCHLEA

EFFECTS OF LASER ON GUINEA PIG COCHLEAR FUNCTION  
A66-82132

## COHERENCE COEFFICIENT

DOPPLER SHIFT AND HIGH VELOCITY MIRROR  
TRANSLATION EFFECTS ON MUTUAL OPTICAL COHERENCE  
FUNCTION OF GAS LASER MICHELSON INTERFEROMETERS  
A66-35387

## COHERENT LIGHT

HOLOGRAMS AND WAVEFRONT RECONSTRUCTION TECHNIQUES  
INVOLVING PRISMATIC REFRACTION OF MONOCHROMATIC  
AND COHERENT LASER LIGHT CAUSING INTERFERENCE  
PATTERN ON PHOTOGRAPHIC EMULSION A66-25144

COHERENT LIGHT RECORDING/REPRODUCING TECHNIQUES

BASED ON DEBYE THEORY OF COHERENT LIGHT SOURCE  
FOCUSING A66-25541

MAGNITUDE AND PHASE OF COMPLEX SPATIAL COHERENCE  
OF HE- NE LASER BEAM A66-26334

TWO-BEAM INTERFEROMETRY IN COHERENCE THEORY  
A66-26965

LASER DETECTION OF COHERENT LIGHT AND  
SUPERHETERODYNE AND NONLINEAR PARAMETRIC STUDIES  
IN OPTICAL SPECTRUM A66-27821

COHERENT EMISSION FROM TRIVALENT HOLMIUM IONS IN  
RARE EARTH SUBSTITUTED YTTRIUM ALUMINUM GARNET,  
NOTING THREE ENERGY TRANSFER COMBINATIONS IN YAG  
A66-28690

THERMAL EFFECTS IN VARIOUS MEDIA DUE TO LASER BEAM  
A66-29209

GIANT COHERENT LIGHT PULSE GENERATION BY Q-  
FACTOR-MODULATED LASER A66-31183

OPTICAL COHERENCE FUNCTIONS AND PROPERTIES FROM  
STATISTICAL VIEWPOINT FOR APPLICATION TO  
SPECTROSCOPY AND STELLAR INTERFEROMETRY A66-31987

THERMAL EFFECTS IN VARIOUS MEDIA DUE TO LASER BEAM  
A66-33058

MEASURING AMPLIFICATION OF COHERENT OPTICAL  
RADIATION IN NEON-HELIUM FILLED TUBE A66-33512

COHERENT LASER-TYPE LIGHT GENERATORS WITH  
CAPABILITY OF ADJUSTING FREQUENCY OVER VISIBLE  
SPECTRUM A66-36265

HOLOGRAPHY PRINCIPLES, DISCUSSING BASIC EQUATION,  
FOURIER TRANSFORM HOLOGRAMS AND HOLOGRAM  
INTERFEROMETRY A66-36929

COHERENT LASER LIGHT USE IN ATMOSPHERIC  
COMMUNICATIONS SYSTEM, DISCUSSING EFFECT OF  
ATMOSPHERIC TURBULENCE AND SMALL VIBRATIONS ON  
COHERENT DETECTION EFFICIENCY AND SNR A66-36930

FREQUENCY TUNING OF COHERENT EMISSION OVER  
VIBRONIC CONTINUUM OF PHONON-TERMINATED OPTICAL  
MASERS BY THERMAL TUNING AND WAVELENGTH-SELECTIVE  
FEEDBACK A66-41369

MEASURING AMPLIFICATION OF COHERENT OPTICAL  
RADIATION IN NEON-HELIUM FILLED TUBE A66-42125

PULSED LASER HOLOGRAPH AND PROBLEM OF  
OVERCOMING LIMITED COHERENCE A66-42560

GAS-DISCHARGE CW LASERS, PARTICULARLY HE- NE,  
CARBON DIOXIDE, ARGON-ION AND PULSED SELF-  
TERMINATING LASERS, DISCUSSING CLASSIFICATION,  
POWER OUTPUT AND GAIN, DOPPLER WIDTH, COHERENCE  
AND NOISE A66-42801

HORIZONTAL DEFLECTION IN TV DISPLAY PRODUCED BY  
BRAGG REFLECTION OF LASER LIGHT BY ULTRASONIC  
WAVES IN WATER A66-42816

DEGREE OF COHERENCE OF OPTICAL BEAM TRAVERSING  
ATMOSPHERIC MEDIUM INCLUDING SIMULATED FOG FOR  
DESIGN OF OPTICAL HETERODYNE RECEIVER  
NASA-CR-76078 A66-29972

QUANTUM GENERATORS AND COHERENT LIGHT AMPLIFIERS  
JPRS-36295 A66-29984

FARADAY ROTATORS FOR HIGH POWER LASER CAVITIES AND  
INTERACTION OF MACROSCOPIC PARTICLES WITH  
COHERENT LIGHT BEAMS A66-36913  
AFOSR-66-1090

INTERACTION OF MACROSCOPIC PARTICLES WITH COHERENT  
LIGHT BEAMS A66-36915

PARTIALLY COHERENT LIGHT DIFFRACTION CALCULATIONS



- APPLIED TO RUBY LASER RADIATION  
TG-230-T478 N66-37071
- MODULATION AND SCANNING OF COHERENT LIGHT FOR  
APPLICATION TO SIMULATION DISPLAY GENERATION  
AMRL-TR-66-9 N66-39473
- SURFACE EFFECT ON TEMPERATURE, I-V AND WATT-  
AMPERE CHARACTERISTICS OF P-N JUNCTION  
SEMICONDUCTOR INJECTION LASER DIODE AS COHERENT  
LIGHT SOURCE A67-10077
- INTERFERENCES BETWEEN WAVES DIFFRACTED BY CIRCULAR  
SCREENS OR THIN WIRES AND COHERENT BACKGROUND  
PROVIDED BY LASER, PRODUCING RINGS OR RECTILINEAR  
FRINGES A67-10231
- UNIDENSITY COHERENT LIGHT PROCESSING SYSTEM  
/ UNICON/ A67-11034
- SPATIAL COHERENCE OF LASER LIGHT BEAM AFTER  
EXTREME WAVEFRONT DISTORTIONS ON DIFFUSION  
EXPLAINED ON BASIS OF FRAUNHOFER AND FRESNEL  
DIFFRACTION A67-11062
- FOURIER TRANSFORM HOLOGRAPHY FOR DIFFUSION OF  
COHERENT LASER LIGHT BEAM, EXAMINING DISTORTION  
TERM IN RECONSTRUCTED IMAGE A67-11063
- HOLOGRAM PROCESS FOR OBJECT REFLECTING OR  
DIFFUSING QUASI-MONOCROMATIC LIGHT, INCLUDING  
EFFECTS OF PARTIAL SPATIAL COHERENCE A67-11079
- GIANT COHERENT LIGHT PULSE GENERATION BY Q-FACTOR  
MODULATED LASER A67-12941
- INTERFERENCES BETWEEN COHERENT LIGHT BACKGROUND  
AND LIGHT DIFFRACTED BY SMALL APERTURE IN CASE OF  
STRONGLY ASTIGMATIC BEAM A67-14416
- PHASE LOCKED LASER LOOP FOR AMPLITUDE AND PHASE  
MEASURING DEVICE FOR COHERENT OPTICAL WAVE FRONTS  
A67-15076
- MULTIPHOTON ABSORPTION PROCESSES, COHERENCE OF  
RADIATION FIELDS AND STATISTICAL PROPERTIES OF  
LASER LIGHT ABSORPTION A67-16681
- COHERENCE AND FLUCTUATIONS OF LIGHT INCLUDING  
STELLAR CORRELATION INTERFEROMETRY, PHOTON  
BUNCHING, ETC A67-17569
- OPTICAL PATHS AND VARIABLE-CONTRAST INTERFERENCE  
AT MICHELSON INTERFEROMETER WHICH ADDS TWO GROUPS  
OF TWO LASER COHERENT WAVES A67-17636
- STATISTICAL DETERMINATION OF CORRELATION FUNCTIONS  
OF PLASMA SCATTERED COHERENT LIGHT A67-17824
- COHERENT OPTICAL SIGNAL PROCESSORS N67-13073
- THREE-DIMENSIONAL HOLOGRAPHY  
NEL-1403 N67-16644
- HOLOGRAPHIC METHODS, AND APPLICATIONS BASED ON  
LASERS AS COHERENT LIGHT SOURCE N67-17791
- COHERENT RADIATION**
- SPATIAL SELECTIVE FADING AS RANDOM PROCESS,  
DISCUSSING SPATIAL COHERENCE, WAVE NUMBER  
DISPERSION PROFILE, TIME DELAY PROFILE, ETC, IN  
IONOSPHERIC PROPAGATION A66-26859
- LASER RADIATION COHERENCE PROPERTY DETERIORATION  
AND MOLECULAR SCATTERING DURING PROPAGATION  
THROUGH TURBULENT ATMOSPHERE A66-27131
- OPTICALLY CONNECTED LASER CONSTRUCTED ON GALLIUM  
ARSENIDE P-N JUNCTION, NOTING COHERENT RADIATION  
A66-28262
- LASER LINES DUE TO ENERGY TRANSFER FROM COLOR  
CENTERS TO ERBIUM IONS IN CALCIUM FLUORIDE  
CRYSTALS IRRADIATED BY GAMMA RAY A66-30278
- TRUNCATED EQUATIONS DESCRIBING COHERENT RADIATION  
OF EXCITED CHROMIUM IONS IN RUBY SITUATED IN  
TRAVELING WAVE RESONATOR A66-31547
- MINIMUM SPECTRAL LINE WIDTH, THRESHOLD CURRENT  
DENSITY, RADIATION-PEAK DISPLACEMENT AND POSSIBLE  
RECOMBINATION MECHANISM FOR GA SB LASER DIODE P-N  
JUNCTIONS IN COHERENT RADIATION A66-31764
- COHERENT EMISSION OF INDIUM ARSENIDE PHOSPHIDE P-N  
JUNCTION A66-31788
- FOCUSED LASER COHERENT RADIATION-INDUCED  
DEGRADATION OF SOLID METHYLENE AND GAS  
CHROMATOGRAPHIC ANALYSIS OF REACTION PRODUCTS  
A66-31870
- LASER OSCILLATION IN FLASH PHOTOLYSIS OF CARBON  
DISULPHIDE AND OXYGEN TO FORM CO A66-31941
- OSCILLATION CONDITIONS FOR FEEDBACK LASERS,  
SUPERRADIANT DIRECTIONALLY COHERENT EMISSION  
LASERS AND COHERENCE BRIGHTENED EMISSION LASERS  
A66-32628
- LASER BASED ON EXCITATION OF GALLIUM PHOSPHORUS  
ARSENIDE SOLID SOLUTION BY BEAM OF FAST ELECTRONS  
A66-33304
- COHERENCE IN RADIATION PEAKS OF RUBY LASER STUDIED  
THROUGH INTERFERENCE FIELD A66-33510
- LASER ACTION ON SEVERAL HYPERFINE TRANSITIONS IN  
MN I A66-34000
- SPATIAL COHERENCE MEASUREMENT OF HE- NE LASER  
OUTPUT A66-35592
- SELECTIVE FEEDBACK AND SATURATION MECHANISMS OF  
RAMAN LASERS USING SECONDARY RAMAN LINES,  
EMPHASIZING CYCLOHEXANE A66-37777
- COHERENT RADIATION GENERATION IN ELECTRON-HOLE  
INDIUM ANTIMONIDE PLASMA, DISCUSSING EMISSION  
SPECTRUM A66-40319
- COHERENCE IN RADIATION PEAKS OF RUBY LASER STUDIED  
THROUGH INTERFERENCE FIELD A66-42124
- COHERENT AMPLIFICATION OF RF RADIATION IN COSMIC  
SPACE A66-42754
- QUENCHING OF STIMULATED RAMAN SCATTERING OF  
COHERENT RADIATION BY TWO-PHOTON ABSORPTION IN  
ORGANIC LIQUIDS A66-43039
- OPTICAL SURFACE ROUGHNESS MEASUREMENT USING  
COHERENT RADIATION PRODUCED BY HELIUM-NEON LASER  
SIGMA-POLARIZED AT 6328 ANGSTROMS A67-10020
- MINIMUM SPECTRAL LINE WIDTH, THRESHOLD CURRENT  
DENSITY, RADIATION-PEAK DISPLACEMENT AND POSSIBLE  
RECOMBINATION MECHANISM FOR GA SB LASER DIODE P-N  
JUNCTIONS IN COHERENT RADIATION A67-10085
- SPONTANEOUS AND INDUCED COHERENT RADIATION FROM  
INDIUM ANTIMONIDE ELECTRON-HOLE PLASMA A67-10088
- COHERENT EMISSION OF INDIUM ARSENIDE PHOSPHIDE P-N  
JUNCTION A67-10101
- CONTINUOUS COHERENT RADIATION OF GA AS  
SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT  
AMBIENT TEMPERATURE OF 77 DEGREES K A67-10548
- COHERENT AMPLIFICATION OF RF RADIATION IN COSMIC  
SPACE A67-10836
- CONTINUOUS COHERENT RADIATION OF GA AS  
SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT  
AMBIENT TEMPERATURE OF 77 DEGREES K A67-11056

- LASER BASED ON EXCITATION OF GALLIUM PHOSPHORUS  
ARSENIDE SOLID SOLUTION BY BEAM OF FAST ELECTRONS  
A67-11824
- SCATTERING OF PARTIALLY COHERENT RADIATION BY  
NEUTRAL MOLECULES FORMULATED AS RANDOM PROCESS  
A67-12096
- LASER EMISSION IN PURE CADMIUM SULFIDE CRYSTALS  
BOMBARDED BY ELECTRON BEAMS  
A67-12812
- RUBY LASER FREQUENCY CONVERSION TECHNIQUE BY LASER  
BEAM SCATTERING AND MIXING OF COMBINED FREQUENCIES  
A67-13094
- S HF MODULATION TECHNIQUES FOR LASER RADIATION,  
COVERING FARADAY, KERR AND POCKEL EFFECTS,  
CIRCULAR DICHROISM, ETC  
A67-13138
- COHERENT HOMODYNE DETECTION AT 10.6 MICROMETERS  
WITH ALUMINUM-DOPED SILICON PHOTOCONDUCTOR,  
PRESENTING NOISE SPECTRA AND VOLTAGE  
A67-13989
- SEMICONDUCTOR LASERS WITH RADIATING MIRRORS  
DEVELOPED BY EXCITATION, USING ELECTRON BEAM AND  
NEODYMIUM LASER GLASS RADIATION  
A67-16669
- DEGREE OF COHERENCE OF TWO POINTS ILLUMINATED BY  
PLANE QUASI-MONOCROMATIC SOURCE  
A67-17574
- ELECTRON BEAM SPATIAL SCANNING OF COHERENT  
EMISSION OF GaAs JUNCTION LASER AT LOW  
TEMPERATURES, MAKING CURRENT DISTRIBUTION  
NONUNIFORM  
A67-18150
- SPECTRAL ANALYSIS OF EMISSION OF SPATIALLY  
SEPARATED SPOTS IN GaAs INJECTION LASERS  
A67-20185
- RAMAN GENERATOR FOR AMPLIFICATION OF COHERENT  
RADIATION, AND SPECTRAL CHARACTERISTICS OF  
GAS LASER WITH ONE DIRECTION TRAVELING WAVE  
PROPAGATION  
FTD-MT-65-399  
N67-11313
- RAMAN GENERATOR FOR AMPLIFICATION AND GENERATION  
OF COHERENT RADIATION  
N67-11314
- DEVELOPMENT OF OPTICAL QUANTUM GENERATOR FROM  
HIGHLY IONIZED LOW TEMPERATURE TO CONVERT HEAT  
ENERGY INTO ELECTRIC AND COHERENT LIGHT  
RADIATION ENERGIES FOR USE IN LASER  
JPRS-39659  
N67-18113
- COHERENT SCATTERING**  
MULTIPLE SCATTERING EFFECTS ON PROPAGATION OF  
COHERENT OPTICAL SIGNALS STUDIED FOR LASER  
COMMUNICATIONS APPLICATION  
A66-28580
- OBJECT-IMAGE RELATIONSHIPS IN SCATTERED LASER  
LIGHT  
A67-16792
- COHERENT SOURCE**  
ABSORPTION COEFFICIENTS FOR ALPHA-POLARIZED  
RADIATION USING RUBY LASER AS COHERENT SOURCE AND  
EBERT SPECTROMETER AS INCOHERENT SOURCE  
TR-4  
N66-34159
- COHERENT TRANSMISSION**  
COHERENT TRANSMISSION OF OPTICAL RADAR FROM LASER  
SOURCE AND USE OF RF SUBCARRIERS PLACED ON  
OPTICAL BEAMS FOR WIDEBAND COMMUNICATIONS PURPOSES  
A66-28404
- LINEAR INSTABILITY OF LASER PROPAGATION IN FLUID  
WITH COUPLING BETWEEN LIGHT AND MEDIUM  
A66-35034
- WAVELENGTH DEPENDENCE OF SPECTRUM OF LASER BEAMS  
TRAVERSING ATMOSPHERE  
A67-16793
- GAS LENS FOCUSING OF LIGHT BEAMS, USING HIGHLY  
TRANSPARENT GAS WITH WEAKLY VARYING REFRACTIVE  
INDEX TO GUIDE COHERENT TRANSMISSION WITH SMALL  
LOSSES  
A67-19789
- COLD ACCLIMATIZATION**  
BIOMEDICAL PREPARATIONS FOR MANNED LUNAR LANDING,  
COLD ACCLIMATIZATION IN FAR NORTH, AND LASERS IN  
OPHTHALMOLOGY  
JPRS-36229  
N66-33200
- COLD CATHODE**  
ALUMINUM COLD CATHODES FOR SINGLE MODE HELIUM  
NEON GAS LASERS  
N67-16017
- COLLISION RATE**  
ELECTRON COLLISION RATE AND DENSITY CALCULATIONS  
FOR He-Ne LASER PLASMA  
A67-16598
- COMMUNICATION SYSTEM**  
F M LASER AND OPTICAL HETERODYNES IN OPTICAL  
COMMUNICATION SYSTEMS  
A66-26004
- COMMUNICATION SYSTEMS AT MICROWAVE AND OPTICAL  
FREQUENCIES FOR FUTURE MARS MISSIONS  
A66-33793
- COHERENT AND NONCOHERENT SEMICONDUCTOR LASERS FOR  
DEVELOPMENT OF FREQUENCY- AND PULSE-MODULATED  
COMMUNICATIONS SYSTEMS  
ESD-TDR-65-232  
N66-25513
- OPTICAL MODULATOR FOR SATELLITE TO GROUND OR  
GROUND TO GROUND LASER COMMUNICATION LINK  
NASA-TM-X-55539  
N66-30362
- GAS LASER AND TELESCOPE TECHNIQUES FOR DEEP SPACE  
OPTICAL COMMUNICATION SYSTEM  
NASA-CR-77482  
N66-35245
- DESIGNS OF QUANTUM ELECTRONIC SYSTEMS - RUBY  
LASERS, QUANTUM AND OPTICAL GENERATORS, OPTICAL  
GATES, WAVEGUIDES, ELECTROMAGNETIC WAVE  
PROPAGATION, AND COMMUNICATION SYSTEMS  
JPRS-37132  
N66-37709
- R CA DEFENSE ELECTRONIC PRODUCTS APPLIED RESEARCH  
A67-11785
- COMMUNICATION SYSTEM RESEARCH ON HYDROGEN MASER,  
SOLID STATE IMAGE CONVERTER, AND TELEMETRY  
SIGNAL PROPAGATION  
NASA-TM-X-55335  
N67-16724
- COMMUNICATION THEORY**  
INTERCHANNEL GENERATION TRANSFER AND MULTICHANNEL  
GENERATION IN LASER WITH FOUR UNSPLIT LEVELS,  
NOTING RADIATION DENSITY, TEMPERATURE EFFECT AND  
VARIATIONS IN COEFFICIENTS OF LOSSES  
A66-38956
- LASER APPLICATION TO RADAR SIGNAL PROCESSING AND  
COMMUNICATIONS EQUIPMENT  
A67-15303
- INTERCHANNEL GENERATION TRANSFER AND MULTICHANNEL  
GENERATION IN LASER WITH FOUR UNSPLIT LEVELS,  
NOTING RADIATION DENSITY, TEMPERATURE EFFECT AND  
VARIATIONS IN COEFFICIENTS OF LOSSES  
A67-15760
- R CA PAPERS ON LASER RESEARCH AND ENGINEERING  
A67-19079
- COMMUNICATIONS DEVICE**  
RUBY LASERS IN SPACE COMMUNICATION  
FTD-TT-65-1683/184  
N66-26501
- COMMUNICATIONS SATELLITE**  
EQUIPMENT DESCRIPTIONS AND PROCEDURES FOR LASER  
COMMUNICATION SATELLITE EXPERIMENT / LCSE/  
NASA-CR-77462  
N66-35171
- COMPONENT RELIABILITY**  
CAUSES OF FAILURE AND GUIDELINES FOR DESIGN OF  
SOLID STATE LASERS  
A66-27669
- COMPRESSION WAVE**  
SUMMARY REPORTS ON RESEARCH IN PLASMA SOURCES,  
IONIZATION FRONTS, COMPRESSIONAL WAVES, GIANT  
ALFVEN WAVES, MICROWAVE INTERFEROMETRY, LASERS,  
AND MAGNETO-KERR EFFECT  
NP-15940  
N66-34712

## COMPTON EFFECT

SCATTERING OF ELECTRON BEAM BY STANDING WAVES OF  
PHOTONS INSIDE LASER CAVITY CORRESPONDS TO  
STIMULATED COMPTON EFFECT A66-26155

MULTIPHOTON PROCESSES DUE TO LASER ACTION -  
CRITICAL INTENSITY CHARACTERISTICS, COMPTON  
SCATTERING, BREMSSTRAHLUNG, PHOTOELECTRIC  
EFFECT, AND ELIMINATION OF INFRARED DIVERGENCE  
CEA-R-2888 N66-29032

## COMPUTER DESIGN

LASERS APPLIED TO LOGIC, MEMORY, INPUT-OUTPUT AND  
DATA TRANSMISSION-LINKAGES PARTS OF COMPUTERS  
A66-42804

## COMPUTER METHOD

RADIATION CONTROL OF RUBY LASER BY DIFFRACTION  
MODULATOR WITH TRAVELING ULTRASONIC WAVE, NOTING  
COMPUTER SOLUTION OF KINETIC EQUATIONS OF  
POPULATION BALANCE, RADIATION DENSITY,  
CHARACTERISTIC DAMPING, ETC A66-33515

RADIATION CONTROL OF RUBY LASER BY DIFFRACTION  
MODULATOR WITH TRAVELING ULTRASONIC WAVE, NOTING  
COMPUTER SOLUTION OF KINETIC EQUATIONS OF  
POPULATION BALANCE, RADIATION DENSITY,  
CHARACTERISTIC DAMPING, ETC A66-42128

COMPUTER CALCULATIONS PERMITTING INVESTIGATION OF  
TIME CHARACTERISTICS OF RADIATION IN INVESTIGATION  
OF LASER WITH PASSIVE CELL A67-13962

## CONDUCTION BAND

OPTICAL NONLINEARITIES DUE TO CONDUCTION BAND  
ELECTRONS IN IN AS, IN SB, GA AS AND PB TE  
STUDIED, USING Q-SWITCHED CARBON DIOXIDE LASER  
RADIATION A67-12524

OPTICAL MIXING DUE TO CONDUCTION BAND ELECTRONS IN  
SEMICONDUCTOR A67-12525

## CONFERENCE

DESIGNS OF QUANTUM ELECTRONIC SYSTEMS - RUBY  
LASERS, QUANTUM AND OPTICAL GENERATORS, OPTICAL  
GATES, WAVEGUIDES, ELECTROMAGNETIC WAVE  
PROPAGATION, AND COMMUNICATION SYSTEMS  
JPRS-37132 N66-37709

ANNUAL ELECTRON AND LASER BEAM SYMPOSIUM,  
UNIVERSITY OF MICHIGAN, ANN ARBOR, APRIL 1966  
A67-15300

CONFERENCE PAPERS ON ELECTRO-OPTICAL DEVICES AND  
TECHNIQUES IN COMMUNICATIONS, INSTRUMENTATION,  
GUIDANCE, AND RADAR  
AGARD-CP-5 N67-13061

## CONSERVATION EQUATION

MODE CHARACTERISTICS OF SOLID STATE LASERS FROM  
ANALYTICAL SOLUTION OF CONSERVATIVE EQUATION  
A66-33839

MODE CHARACTERISTICS OF SOLID STATE LASERS FROM  
ANALYTICAL SOLUTION OF CONSERVATIVE EQUATION  
A67-13208

## CONTINUOUS WAVE

PERFORMANCE OF TWO-PHOTON LASER OPERATING IN  
CONTINUOUS WAVE MODE, DERIVING FORMULA FOR PULSE  
FREQUENCY A66-28166

PULSED TOROIDAL EXCITATION OF GAS ION LASERS  
EXTENDED TO DRIVE HIGH POWER CW LASER TRANSITIONS  
IN AR, KR, CL AND BR, NOTING OPERATING  
PARAMETERS AND POWER OUTPUT A66-28877

C W IR LASER OSCILLATION IN ATOMIC CL IN H CL  
AND HI GAS DISCHARGES, NOTING USE OF TWO POWER  
SUPPLIES AND ENERGY LEVEL DIAGRAM  
A66-28880

HIGH POWER CONTINUOUS WAVE FOUR-LEVEL SOLID  
NEODYMIUM GLASS LASER SHOWING LENGTH AND HOST LOSS  
AS DOMINANT FACTORS IN LIMITING OUTPUT POWER  
A66-33334

SOLID STATE CW OPTICALLY PUMPED MICROWAVE MASER,  
USING DIVALENT THULIUM DOPED CALCIUM FLUORIDE

A66-33614

FIRST- AND SECOND-ORDER SIDEBANDS DUE TO STRONG  
CW SIGNAL INTERMODULATION EFFECT IN 3.39 MU HE-  
NE LASER A66-33615

OUTPUT POWER OF CW LASER MEASURED BY WIRE  
BOLOMETER IN FORM OF PLANE SINGLE-LAYER SPIRAL AS  
SENSITIVE ELEMENT A66-35321

CONTINUOUS WAVE GAS LASER AS LIGHT SOURCE IN  
SCATTERED LIGHT STATIC PHOTOELASTICITY A66-37443

CONTINUOUS WAVE UV IONIZED GAS LASER EMISSION  
OVER FOUR TRANSITIONS IN NEON, KRYPTON AND ARGON  
A66-37771

SELF-INDUCED DIVERGENCE OF CONTINUOUS WAVE HE- NE  
LASER BEAMS WHEN TRAVERSING TRANSPARENT LIQUID,  
NOTING NONLINEAR EFFECT IN PROPAGATION OF LIGHT  
A66-39164

FREQUENCY TUNING OF COHERENT EMISSION OVER  
VIBRONIC CONTINUUM OF PHONON-TERMINATED OPTICAL  
MASERS BY THERMAL TUNING AND WAVELENGTH-SELECTIVE  
FEEDBACK A66-41369

COMPETITION, HYSTERESIS AND REACTIVE Q-SWITCHING  
IN CARBON DIOXIDE LASERS AT 10.6 MICRONS, USING  
MOVING MIRROR TECHNIQUE A66-41631

10.6 MICRON OUTPUT OF CARBON DIOXIDE- HE LASER  
MODULATED, USING BRAGG DIFFRACTION FROM  
LONGITUDINAL ACOUSTIC WAVES IN TE A66-42251

MODE SELECTION, RELAXATION OSCILLATIONS, MODE  
INTERACTION AND THERMAL EFFECTS IN ROOM  
TEMPERATURE CW LASERS IN ELLIPSOIDAL PUMPING  
SYSTEMS A66-42546

LINEARIZED POPULATION RATE EQUATIONS AND QUANTUM  
NOISE SOURCES USED TO CALCULATE SPECTRA OF  
INTRINSIC SECOND MOMENT INTENSITY FLUCTUATIONS IN  
3- AND 4-LEVEL CW LASER OSCILLATORS A66-42548

CRYSTALLINE SOLID LASERS, CONSIDERING RARE EARTH  
AND TRANSITION METAL IMPURITIES AND HOST  
MATERIALS, NOTING CW LASER CHARACTERISTICS  
A66-42799

GAS-DISCHARGE CW LASERS, PARTICULARLY HE- NE,  
CARBON DIOXIDE, ARGON-ION AND PULSED SELF-  
TERMINATING LASERS, DISCUSSING CLASSIFICATION,  
POWER OUTPUT AND GAIN, DOPPLER WIDTH, COHERENCE  
AND NOISE A66-42801

RAMAN SCATTERING STUDIES USING CONTINUOUS WAVE  
OPTICAL MASERS AND SPECTROMETERS  
MIT-DSR-4979 N66-27897

OPTIMIZATION OF HIGH-POWER CONTINUOUS-WAVE GAS  
LASER HAVING CARBON DIOXIDE, NITROGEN, AND HELIUM  
MIXTURE AS ACTIVE MEDIUM  
S-865 N66-38449

TIME VARIATION IN INTENSITY OF LIGHT EMITTED FROM  
CW GA AS LASER DIODES A67-10243

C W LASER USING 3-INCH RUBY CRYSTALS WITH 15  
PERCENT MIRROR TRANSMISSION, PUMPING POWER OF  
DOUBLE THRESHOLD VALUE AND 1.6 WATT POWER OUTPUT  
A67-10244

THREE NEW VISIBLE CW LASER LINES IN DISCHARGE IN  
SINGLY-IONIZED CL A67-10373

EXTENSOMETER FOR MEASURING SMALL CHANGES OF  
SPECIMEN ON TENSILE TESTING VACUUM FURNACE AT  
HIGH TEMPERATURES, USING CW GAS LASER AS LIGHT  
SOURCE A67-11036

PERFORMANCE OF TWO-PHOTON LASER OPERATING IN  
CONTINUOUS WAVE MODE, DERIVING FORMULA FOR PULSE  
FREQUENCY A67-13292

C W HE- NE LASER COMPARED WITH MERCURY ARC

- SOURCE, OBTAINING RAMAN SPECTRA OF CARBON TETRACHLORIDE BY THREE METHODS OF EXCITATION  
A67-13912
- LINE WIDTH OF CW GA-AS LASERS MEASURED USING HOMODYNE DETECTION AND AUTOCORRELATION  
A67-16670
- ARGON DISCHARGE CHARACTERISTICS USED IN CONTINUOUS ACTION ION LASER FOR ANALYSIS OF INVERSION PRODUCTION MECHANISM  
A67-16680
- LASER STUDIES AT RCA VICTOR RESEARCH LABORATORIES, MONTREAL, DISCUSSING SPECTROSCOPIC, INTERFEROMETRIC AND PLASMA DIAGNOSTIC RESEARCH  
A67-19082
- RELATIVE INTENSITIES AND CASCADE TRANSITION RATIO IN CW AR II LASER NEAR 4103.9 ANGSTROMS  
A67-19560
- INTERFEROMETRIC TYPE RANGING SYSTEM UTILIZING CW LASER  
NASA-TM-X-55608  
N67-11380
- CONTINUOUS WAVE /CW/ RADAR**  
METAL WALL IONIZED ARGON LASERS, DISCUSSING USE OF WATER-COOLED QUARTZ DISCHARGE CHANNELS, CW LASERS, DEVELOPMENT OF SATISFACTORY METAL, ETC  
A66-25555
- DIGITAL-MODE FM CW LASER RANGING AND TRACKING SYSTEM USING COMPOUND AXIS SERVOMECHANISM  
A66-25982
- CORRELATIONS AND INTENSITY FLUCTUATIONS IN LIGHT FROM INDIVIDUAL LASING AND NONLASING MODES OF CW GA AS LASER AND THRESHOLD NOISE CHANGE IN LASER EMISSION  
A66-26210
- CONTINUUM MECHANICS**  
THERMOELASTIC WAVE EQUATIONS IN CONTINUUM MECHANICS MODEL OF LASER-INDUCED FRACTURE IN TRANSPARENT MEDIA IN TERMS OF LASER BEAM ENERGY ABSORPTION  
A66-40089
- CONTINUUM RADIATION**  
X UV C, TI, MN, FE, NI, CU, ZN AND AR LINE SPECTRA AND CONTINUUM RADIATION SPECTRA IN PLASMAS PRODUCED BY FOCUSED RUBY LASER BEAM  
A66-39812
- CONTINUOUS COHERENT RADIATION OF GA AS SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT AMBIENT TEMPERATURE OF 77 DEGREES K  
A67-10548
- CONTINUOUS COHERENT RADIATION OF GA AS SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT AMBIENT TEMPERATURE OF 77 DEGREES K  
A67-11056
- CONTROLLED FUSION**  
CONTROLLED THERMONUCLEAR STUDIES - CAULKED STUFFED CUSP MINIMUM- B MACHINE, SCYLLA OPERATION AND MEASUREMENTS, RUBY LASER TESTING, PLASMA GUNS, AND ELECTRIC AND MAGNETIC FIELD MEASUREMENTS  
LA-3434-MS  
N66-25226
- COOLING**  
AMPLIFICATION OF INTERACTION OF ATOMS AND OF PULSED OR PERIODIC COOLING OF TRANSPARENT MEDIA PRODUCED BY LASER BEAM, NOTING CHANGES IN KINETIC ENERGY OF ATOMS  
A66-26021
- INJECTION LASER COOLING BY REMOVAL OF HEAT FROM ENVIRONMENT FOR CONVERSION TO LIGHT  
NASA-CR-76761  
N66-32437
- LASER ACTION BY RAPID ELECTRON COOLING OF IONIZED DENSE HYDROGEN PLASMA  
N66-32700
- COOLING SYSTEM**  
LOW TEMPERATURE TECHNIQUES IN SATELLITE COMMUNICATIONS SYSTEMS, NOTING MASER, COOLED PARAMETRIC AMPLIFIER AND TREND TOWARD CLOSED-CYCLE REFRIGERATORS  
A66-26104
- COOLER FOR SEMICONDUCTOR LASERS AND PHOTODETECTORS
- USING LOW TEMPERATURE GAS  
A66-26559
- HELIUM COOLING SYSTEM FOR SOLID STATE MASER AMPLIFIER INSTALLATION AT COMMUNICATION SATELLITE GROUND STATION  
N67-12314
- COPPER CHLORIDE**  
LUMINESCENCE SPECTRUM OF CU CL AT LOW TEMPERATURES EXCITED BY DOUBLE PHOTON ABSORPTION FROM HIGH INTENSITY LASER BEAM  
A67-17822
- CORRELATION FUNCTION**  
EFFECTIVE DIFFUSION CROSS SECTION OF ULTRASONIC AND LASER BEAM WHILE ACTING ON TURBULENT FLOW  
A66-25404
- CORRELATIONS AND INTENSITY FLUCTUATIONS IN LIGHT FROM INDIVIDUAL LASING AND NONLASING MODES OF CW GA AS LASER AND THRESHOLD NOISE CHANGE IN LASER EMISSION  
A66-26210
- PHOTOELECTRON COUNTS OF PHOTOMULTIPLIER ILLUMINATED BY GAS LASER LIGHT SOURCE  
A66-26211
- QUANTUM THEORY OF LASERS PRESENTED IN TERMS OF CORRELATION FUNCTIONS OF SECOND-QUANTIZED ELECTROMAGNETIC AND MATTER FIELDS  
A66-26214
- GENERAL NONEQUILIBRIUM SYSTEM IN CONTACT WITH RESERVOIR DESCRIBED VIA CORRELATION FUNCTIONS OF QUANTIZED FIELD OPERATORS, NOTING INFLUENCE OF CAVITY AND OPTICAL PUMP  
A66-38633
- FIRST AND SECOND ORDER CORRELATION FUNCTIONS FOR FIELD OBTAINED BY SUPERPOSITION OF TWO LASER MODES THROUGH YOUNGS EXPERIMENT, USED TO DETERMINE COHERENCE AND STATISTICAL PROPERTIES  
A67-12634
- STATISTICAL DETERMINATION OF CORRELATION FUNCTIONS OF PLASMA SCATTERED COHERENT LIGHT  
A67-17824
- CORTICOSTEROID**  
PARTIAL INHIBITION OF LASER REACTION IN MAN BY TOPICAL CORTICOSTEROIDS  
A67-80434
- COSMIC RADIO WAVE**  
NEGATIVE ABSORPTION IN COSMIC RADIO SOURCES OF SYNCHROTRON RADIATION  
A67-15200
- COUPLED MODE**  
COUPLED WAVE FORMALISM, GIVING UNIFIED DESCRIPTION OF PARAMETRIC DOWN CONVERSION OF LIGHT, STIMULATED BRILLOUIN AND RAMAN EFFECTS, ETC, STRESSING EXPONENTIAL CHARACTER OF GAIN  
A66-26156
- HYSTERESIS PHENOMENA IN HE- NE GAS LASER IN AXIAL MAGNETIC FIELD AND POLARIZATION OF OSCILLATING MODE WITHIN CERTAIN TUNING REGION  
A66-29385
- SECOND-HARMONIC ENHANCEMENT IN NONLINEAR CRYSTAL BY LOSS MODULATOR COUPLING OF PULSED RUBY LASER MODES  
A66-31939
- LASER MIRROR TRANSDUCER DECOUPLING FROM MECHANICAL RESONANCES OF LASER CAVITY  
A66-35813
- COUPLING BETWEEN OPPOSITELY DIRECTED TRAVELING WAVES IN HE- NE RING LASER IN FORM OF MUTUAL BACKSCATTERING OF ENERGY FROM EACH BEAM INTO DIRECTION OF OTHER  
A66-37778
- COUPLING OF ADJACENT AXIAL MODES IN EXTERNAL RAMAN RESONATOR OBSERVED AS FIRST STOKES FREQUENCY WITH BENZENE AS RAMAN MEDIUM AND Q-SWITCHED RUBY LASER AS PUMP SOURCE  
A66-39109
- HIGH MAGNETIC FIELD EFFECT ON INTERBAND SEMICONDUCTOR LASER, PARTICULARLY ELECTROMAGNETIC MODES AND COUPLING AND THRESHOLD CURRENT CONDITIONS  
A67-16673
- QUENCHING OF ONE PULSED RUBY LASER OSCILLATION BY ANOTHER, NOTING COUPLED RATE EQUATIONS FOR STEADY

- STATE AND TRANSIENT BEHAVIOR A67-16682
- HYPERSONIC EXCITATIONS DUE TO BRILLOUIN SCATTERING FOR CASE WITH STOKES FEEDBACK, DERIVING QUANTUM EQUATION OF MOTION FOR CREATION OF LASER AND STOKES MODES AND COUPLED ACOUSTIC MODE A67-16683
- MODE COUPLING EFFECTS DUE TO SCATTERING IN TRAVELING WAVE HELIUM-NEON RING LASER NASA-CR-82490 N67-19096
- COUPLING**
- LASER ACTION IN CLOSED MOLECULAR SYSTEM WITH MIXTURE OF CARBON DIOXIDE, NITROGEN AND WATER VAPOR, NOTING COUPLING-OUT PLATE REFLECTIVITY AND POPULATION INVERSION A66-35433
- ALL-SOLID WAVEGUIDE COMPONENTS FOR SLOT COUPLERS AND WAVEGUIDE LASER NASA-CR-76893 N66-32757
- CRACK FORMATION**
- LASER BEAM EFFECT ON HYDRODYNAMIC BEARINGS, DISCUSSING MICROCRACKS AND CRITICAL ENERGY, EXPLAINING BREAKDOWNS A66-41409
- ORGANIC GLASS DISINTEGRATION INDUCED BY PULSED LASER BEAMS A67-12241
- MICRO- AND MACROCRACK FORMATION IN ORGANIC GLASS BY FOCUSING OF LASER BEAM A67-18808
- CRACK PROPAGATION**
- LI F SINGLE CRYSTAL DESTRUCTION AS FUNCTION OF LASER BEAM ENERGY, EXAMINING DISLOCATION PATTERN ARISING FROM CRACK PROPAGATION A67-10071
- TIME EVOLUTION OF LASER INDUCED FRACTURES IN GLASS, NOTING CRACK PROPAGATION ACCOMPANIED BY SPARKING A67-12508
- CROSS CORRELATION**
- FREQUENCY FLUCTUATIONS OF LASER FIELD DETERMINED BY MEASURING CROSS CORRELATION FUNCTION AT TWO POINTS A67-16625
- CROSS RELAXATION**
- PARAMAGNETIC RESONANCE SPECTRA SHIFT DUE TO TEMPERATURE CHANGE IN CROSS-RELAXATION RUTILE MASER A66-30820
- SPECTRAL HOLE BURNING AND CROSS RELAXATION EFFECTS ON STEADY STATE GAIN SATURATION OF LASER AMPLIFIER WITH INHOMOGENEOUSLY BROADENED LINEWIDTH A66-40098
- TEMPERATURE DEPENDENCE OF PARAMAGNETIC RESONANCE SPECTRAL SHIFTS IN CHROMIUM-DOPED TITANIUM OXIDE CRYSTAL OF CROSS RELAXATION RUTILE MASER A67-19676
- CRYOGENIC EQUIPMENT**
- COOLER FOR SEMICONDUCTOR LASERS AND PHOTODETECTORS USING LOW TEMPERATURE GAS A66-26559
- CRYOGENIC GYROSCOPE**
- INERTIAL SENSORS, DISCUSSING MAGNETIC RESONANCE AND SUPERCONDUCTOR GYROSCOPES, RING LASERS, FLUID DYNAMICAL DEVICES, ELECTROSTATIC GYROSCOPES, ETC A67-16517
- CRYOGENICS**
- MAGNETIC LOW TEMPERATURE Q-SWITCHING OF RUBY LASER N67-12648
- CRYSTAL**
- RUBY AND NEODYMIUM GLASS LASERS SUM FREQUENCY GENERATION USING NONLINEAR ELECTRO-OPTICAL KDP CRYSTAL A67-17754
- LASER EXCITED RAMAN SCATTERING STUDIED AS MEANS FOR INVESTIGATING CRYSTALS CONTAINING IMPURITIES AD-637256 N67-11104
- CRYSTAL DISLOCATION**
- DISLOCATIONS AND PRECIPITATES IN GA AS INJECTION LASERS REVEALED BY NEW A-B ETCHANT A66-31071
- LI F SINGLE CRYSTAL DESTRUCTION AS FUNCTION OF LASER BEAM ENERGY, EXAMINING DISLOCATION PATTERN ARISING FROM CRACK PROPAGATION A67-10071
- KINETICS OF FORMATION AND HEALING OF DAMAGE CAUSED BY LASER PULSE IN LITHIUM FLUORIDE SINGLE CRYSTALS A67-17057
- CRYSTAL GROWTH**
- FLUORESCENT LIFETIMES OF NEODYMIUM, YTTERBIUM AND SAMARIUM INCORPORATED IN ORDERED PEROVSKITE-TYPE COMPOUNDS DETERMINED, NOTING CRYSTAL STRUCTURE POTENTIAL FOR LASER EMISSION A66-27976
- GROWTH OF SINGLE CRYSTALS OF RARE-EARTH FLUORIDES FOR LASER APPLICATION, USING HYDROGEN FLUORIDE ATMOSPHERE, NOTING ION EXCHANGE PURIFICATION A66-31082
- YTTRIUM VANADATE CRYSTALS GROWN AND PROCESSED FOR OPTICAL PURPOSES A66-35434
- MEASUREMENTS ON PHYSICAL AND LASER PROPERTIES OF VAPOR-GROWN RUBY SINGLE CRYSTALS PREPARED BY EPITAXIAL GROWTH A66-36081
- CRYSTAL GROWTH, DIFFUSION AND FABRICATION OF GALLIUM ARSENIDE-PHOSPHIDE JUNCTION LASERS WITH LOW THRESHOLD CURRENT DENSITIES A66-37401
- LASER WITH NONRESONANT FEEDBACK - GROWTH OF SILICON CARBIDE SINGLE CRYSTALS - SCIENCE NOTES N66-28923
- PRODUCTION ENGINEERING MEASURE TO IMPROVE CRYSTAL QUALITY AND PRODUCTION YIELD OF RUBY LASER CRYSTAL GROWTH QPR-2 N66-30291
- AEROSPACE TECHNOLOGY RESEARCH IN U.S.S.R. - LASER ACTION BY SUPERCOOLED PLASMA, LITHIUM CRYSTAL GROWTH, METALLOSILOXANE POLYMER SYNTHESIS AND SPACE TECHNOLOGY CINEMATOGRAPHY N66-32699
- YTTRIUM-ALUMINUM GARNET CRYSTAL GROWTH FROM MOLTEN FLUX FOR LASER APPLICATION N66-34570
- RUBY CRYSTALS GROWN BY CZOCHRALSKI TECHNIQUE USING INDUCTION HEATED IRIIDIUM CRUCIBLE, NOTING LASER OSCILLATIONS IN PULLED CRYSTALS A67-16975
- SPECTRAL PROPERTIES OF ND DOPED YTTRIUM VANADATE GROWN FROM MELT, NOTING REDUCED STARK SPLITTING LEADING TO LASER ACTION A67-19559
- ETCHING METHODS TO VISUALIZE LATTICE DISLOCATIONS AND GRAIN BOUNDARIES IN CZOCHRALSKI GROWN CALCIUM TUNGSTATE CRYSTALS DOPED WITH NEODYMIUM FOR LASER APPLICATION A67-19565
- ELECTRON BEAM MELTING AND FLOAT ZONE CRYSTAL GROWTH TECHNIQUES FOR PROCESSING ALUMINUM OXIDE AND RELATED MATERIALS USED IN LASER TECHNOLOGY AFCRL-66-473 N67-10948
- CRYSTAL LATTICE**
- RUBY LASER-INDUCED EFFECT OF PULSED PRESSURE ON KDP CRYSTAL SURFACE AND THERMAL BULK EFFECT ON EXCITATION OF ULTRASONIC OSCILLATION IN CRYSTAL A66-40318
- CONCENTRATION OF CHROMIUM IONS IN RUBY LASER CRYSTAL LATTICE DETERMINED FROM RADIATION OUTPUT CHARACTERISTICS N66-37712
- FLUX VELOCITY, CRYSTAL QUALITY AND DIAMETER, DISTRIBUTION OF CHROMIUM IONS, AND OTHER FACTORS CONSIDERED IN DESIGN OF RUBY LASER OPTICAL GENERATOR N66-37713
- CRYSTAL OPTICS**
- RUBY LASER EXPERIMENT YIELDING GIANT PULSES BY SEPARATING MIRRORS FROM CRYSTALS A66-25684
- ELLIPTIC CAVITY DESIGN FOR SOLID STATE LASERS,

DISCUSSING MULTIPLE REFLECTIONS, ABSORPTION  
COEFFICIENT, REFRACTION LOSSES, ETC

A66-25998

MONTE CARLO TECHNIQUE TO DETERMINE TOTAL ENERGY  
AND ENERGY DISTRIBUTION IN LASER CRYSTAL DUE TO  
OPTICAL PUMPING

A66-26028

RAMAN DIFFUSION SPECTRA FROM CRYSTALS EXCITED BY  
GAS LASER

A66-26345

CRYSTAL MOTION EFFECT ON TIME BEHAVIOR OF LASER  
GENERATION MODE, USING HIGH SPEED PHOTOGRAPHY AND  
OSCILLOGRAMS

A66-29725

SECOND HARMONIC GENERATION / SHG/ BY FOCUSED LASER  
BEAMS IN NONLINEAR CRYSTALS

A66-29816

GA AS CRYSTAL AS ELECTRO-OPTIC MODULATOR AT 10.6  
MICRONS DUE TO SMALL CARRIER ABSORPTION, FREEDOM  
FROM INTERBAND TRANSITIONS AND HIGH RESISTIVITY

A66-42553

LIGHT SCATTERING TECHNIQUES FOR CRYSTAL EVALUATION  
AFCRL-66-119

N66-26436

NONLINEAR OPTICAL MATERIALS PROPERTIES DISCUSSED  
ON BASIS OF SOVIET AND FOREIGN STUDIES INVOLVING  
LASERS

A67-11011

VOICE COMMUNICATIONS SYSTEM USING GA AS ROOM-  
TEMPERATURE INJECTION LASER AND TV COMMUNICATIONS  
SYSTEM USING GA AS CRYSTALS AS MODULATORS FOR  
LASER BEAMS

A67-11786

FRACTURE MECHANISM OF TRANSPARENT CRYSTALS  
INTERACTING WITH RUBY LASER BEAM

A67-13128

#### CRYSTAL STRUCTURE

FLUORESCENT LIFETIMES OF NEODYMIUM, YTTERBIUM AND  
SAMARIUM INCORPORATED IN ORDERED PEROVSKITE-TYPE  
COMPOUNDS DETERMINED, NOTING CRYSTAL STRUCTURE  
POTENTIAL FOR LASER EMISSION

A66-27976

STATISTICAL EFFECTS DURING GENERATION OF SECOND  
HARMONIC IN OPTICALLY TRANSPARENT CRYSTALS, NOTING  
COEFFICIENT OF CORRELATION BETWEEN HARMONIC AND  
FUNDAMENTAL RADIATION POWER OF SOLID STATE LASER

A66-31167

SEMICONDUCTOR LASERS WITH HIGH POWER EFFICIENCY  
OBTAINED VIA ELECTRON BEAM EXCITATION ON CRYSTALS  
OF MIXED CADMIUM-SULFIDE-SELENIDE ALLOY

A66-31533

C W HE- NE LASER MEASUREMENT OF LIGHT SCATTERING  
IN CRYSTALS NOTING LASER OUTPUT, PERFORMANCE AND  
CRYSTAL IMPERFECTIONS

A66-35402

ORIENTATION EFFECT IN GA AS INJECTION LASERS,  
NOTING EMISSION CHARACTERISTICS AND STRUCTURAL  
SPECTRA

A66-35404

SECOND-HARMONIC GENERATION BY FOCUSED LASER BEAMS  
BASED ON EXPERIMENTS USING HE- NE GAS LASER,  
NOTING SHG SHOULD BE STRONGLY PEAKED WHEN FOCUS  
IS AT EITHER OF CRYSTAL SURFACES

A66-38554

STATISTICAL EFFECTS DURING GENERATION OF SECOND  
HARMONIC IN OPTICALLY TRANSPARENT CRYSTALS, NOTING  
COEFFICIENT OF CORRELATION BETWEEN HARMONIC AND  
FUNDAMENTAL RADIATION POWER OF SOLID STATE LASER

A67-12928

LASER AS SOURCE OF OPTICAL FOURIER ANALYSIS OF  
ATOMIC STRUCTURE OF CRYSTALS

A67-16921

#### CRYSTAL STRUCTURE DEFECT

SCANNING ELECTRON MICROSCOPE TO EXAMINE CRYSTAL  
MOSAIC STRUCTURES AND LASING PROPERTIES OF GALLIUM  
ARSENIDE LASER DIODES

A66-33300

CRYSTAL DEFECTS AND PERFORMANCE IN RUBY LASER,  
MEASURING COHERENCE FUNCTION OF LIGHT AND OUTPUT  
ENERGY AND CRYSTAL HOMOGENEITY

A66-41291

#### CRYSTAL SURFACE

SECOND HARMONIC GENERATION OF LIGHT BY FOCUSED  
LASER BEAMS IN NONLINEAR CRYSTALS AT EXIT SURFACE

A67-16640

PICOSECOND LASER PULSE WIDTHS MEASUREMENT BY  
METHOD USING SPECIAL SYMMETRY PROPERTIES OF SECOND  
HARMONIC GENERATION AT GA AS CRYSTAL SURFACE

A67-20097

#### CRYSTALLOGRAPHY

LIGHT SCATTERING TECHNIQUES FOR CRYSTAL EVALUATION  
AFCRL-66-119

N66-26436

#### CURRENT DENSITY

LASER CAVITY OUTPUT OPTIMIZATION FOR MAXIMUM  
EXTERNAL QUANTUM EFFICIENCY SHOWING DEPENDENCE ON  
LENGTH AND REFLECTIVITY FOR GIVEN CURRENT DENSITY

A66-31535

CRYSTAL GROWTH, DIFFUSION AND FABRICATION OF  
GALLIUM ARSENIDE-PHOSPHIDE JUNCTION LASERS WITH  
LOW THRESHOLD CURRENT DENSITIES

A66-37401

OPTICAL COUPLING USING GALLIUM ARSENIDE LASER FOR  
VARIATION OF FREQUENCY OF DIODE EMISSION THROUGH  
SMALL CHANGE IN CURRENT DENSITY

A66-38920

RECOMBINATION RADIATION FROM GA AS P-N  
JUNCTIONS WITH AND WITHOUT FABRY- PEROT  
RESONATOR, NOTING PARAMETER DEPENDENCE ON CURRENT  
DENSITY

A66-40314

CURRENT TRANSDUCER FOR MEASURING CURRENT PULSES IN  
KILOAMPERE RANGE AND SUITABLE FOR LASER RESEARCH  
APPLICATIONS

A66-42820

OPTICAL COUPLING USING GALLIUM ARSENIDE LASER FOR  
VARIATION OF FREQUENCY OF DIODE EMISSION THROUGH  
SMALL CHANGE IN CURRENT DENSITY

A67-16390

#### CURRENT DISTRIBUTION

GALLIUM ARSENIDE P-N JUNCTION LASER DIODE,  
INJECTION CURRENT DISTRIBUTION, DENSITY AND  
EMISSION SPECTRA VARIATION

A66-25934

LINE WIDTH OF SEMICONDUCTOR LASER

A66-33127

ELECTRON BEAM SPATIAL SCANNING OF COHERENT  
EMISSION OF GA AS JUNCTION LASER AT LOW  
TEMPERATURES, MAKING CURRENT DISTRIBUTION  
NONUNIFORM

A67-18150

#### CYANINE DYE

STIMULATED EMISSION OF POLYMETHINE DYES UPON  
PUMPING WITH Q-SWITCHED LASER, NOTING WAVELENGTH  
PARAMETERS AND OSCILLATION

A66-42247

SATURABLE DYES NOTING MODE SELECTION PROPERTIES  
AND ABSORPTION SPECTRA IN BLEACHED STATE

A66-42253

ABSORBER CONCENTRATION EFFECT ON PULSED LASER  
SYSTEM NOTING PERFORMANCE CHARACTERISTICS,  
THRESHOLD ENERGY, PUMPING DYNAMICS AND TIME  
PARAMETERS

A66-42254

#### CYANOGEN

LASER ACTION IN OPTICALLY PUMPED CN, DISCUSSING  
VIBRATIONAL-ROTATIONAL TRANSITIONS

A67-10370

#### CYCLIC HYDROCARBON

LASER BEAM EFFECT ON BENZENE AND OTHER ORGANIC  
COMPOUNDS, NOTING FORMATION OF DARK READILY  
COAGULATING DEPOSIT

A67-17028

#### CYCLOHEXANE

SELECTIVE FEEDBACK AND SATURATION MECHANISMS OF  
RAMAN LASERS USING SECONDARY RAMAN LINES,  
EMPHASIZING CYCLOHEXANE

A66-37777

SECOND HARMONIC GENERATIONS AND MIXINGS OF RAMAN  
LINES PRODUCED IN CYCLOHEXANE, ACETONE, BENZENE  
AND CARBON DISULFIDE, PHOTOGRAPHING FIRST ORDER

- STOKES RADIATION A67-12052
- CYCLOTRON RESONANCE  
CYCLOTRON RESONANCE EXCITATION OF UPPER LEVEL OF  
GAS-ION LASER A66-31937
- MULTIPLE CYCLOTRON RESONANCE ABSORPTION LINES IN  
DEGENERATE VALENCE BANDS OF GE SEMICONDUCTOR  
STUDIED WITH FAR IR LASER SUBMILLIMETER  
SPECTROMETER A66-42545
- D**
- DAMAGE  
DAMAGE THRESHOLDS FOR VARIOUS GLASSES EXPOSED TO  
LASER PULSES, EMPHASIZING INTERNAL DAMAGE A66-28732
- DATA ACQUISITION  
LASER TECHNIQUE ACQUISITION OF DATA ON EXPLODING-  
WIRE PHENOMENA IN EXPLOSION MODEL, SUPERSONIC  
MODEL AND ABLATION MODEL A66-41701
- LASER GUIDANCE SYSTEM FOR RENDEZVOUS AND DOCKING  
PROVIDING DATA ACQUISITION FOR GUIDANCE COMPUTER A67-15663
- DATA HANDLING SYSTEM  
LASER DISPLAYS APPLICATION, PERFORMANCE AND STATUS  
OF EXISTING DEVICES A67-17887
- DATA RECORDING  
COHERENT LIGHT RECORDING/REPRODUCING TECHNIQUES  
BASED ON DEBYE THEORY OF COHERENT LIGHT SOURCE  
FOCUSING A66-25541
- DATA RECORDING AND PROCESSING SYSTEMS FOR GT-7  
LASER COMMUNICATOR EXPERIMENT - LASER WAVE  
SCATTERING DUE TO REFRACTIVE INDEX PERTURBATIONS  
IN PROPAGATING MEDIUM  
NASA-CR-65553 N66-39966
- DATA RECORD AND READOUT SYSTEMS DEPENDENCE ON  
PRECISE SPOT AND LINE SCAN METHODS, USING  
DIFFRACTION LIMITED SPOTS OF LASER GENERATED LIGHT  
A67-15321
- DATA STORAGE  
EXTREMELY WIDEBAND INFORMATION STORAGE AND  
RETRIEVAL SYSTEMS EMPLOYING LASER OR ELECTRON  
BEAM ON SILVER HALIDE OR ELECTRON BEAM ON  
THERMOPLASTIC FILM A67-11437
- DATA TRANSMISSION  
NARROW LASER BEAM POINTING TECHNIQUE IN DEEP  
SPACE-TO-EARTH DATA TRANSMISSION FOR REDUCTION IN  
ERROR SOURCES A66-40496
- LASERS APPLIED TO LOGIC, MEMORY, INPUT-OUTPUT AND  
DATA TRANSMISSION-LINKAGES PARTS OF COMPUTERS  
A66-42804
- DECAY RATE  
HELIUM-NEON LASER AFTERGLOW AND METASTABLE HELIUM  
ATOMS UNDER LONG PULSE EXCITATION A66-27335
- DEEP SPACE  
GAS LASER AND TELESCOPE TECHNIQUES FOR DEEP SPACE  
OPTICAL COMMUNICATION SYSTEM  
NASA-CR-77482 N66-35245
- TUNABLE TRAVELING WAVE MASER FOR DEEP SPACE  
COMMUNICATIONS AND PLANETARY RADAR  
JPL-TR-32-1072 N67-17168
- DEEP SPACE INSTRUMENTATION FACILITY /DSIF/  
NARROW LASER BEAM POINTING TECHNIQUE IN DEEP  
SPACE-TO-EARTH DATA TRANSMISSION FOR REDUCTION IN  
ERROR SOURCES A66-40496
- TRAVELING WAVE MASER FOR 85-FOOT ANTENNA AT VENUS  
DEEP SPACE STATION N66-38567
- DEFENDER PROJECT  
CONVERSION EFFICIENCY AND THRESHOLD OF STIMULATED  
RAMAN EMISSION IN BENZENE, NITROBENZENE,  
TOLUENE, AND CARBON DISULFIDE - DEFENDER  
PROJECT
- A056-F N66-36239
- FEASIBILITY OF USING FLUORESCING DYES PUMPED WITH  
RUBY LASER FOR LOWER THRESHOLDS THAN RAMAN TYPE  
LASERS  
AD-636953 N66-38187
- DEFENSE INDUSTRY  
R CA DEFENSE ELECTRONIC PRODUCTS APPLIED RESEARCH  
A67-11785
- DEFLECTOR  
OPTICAL BEAM DEFLECTION TECHNIQUE USING  
INTERFEROMETER CAVITY ILLUMINATED BY GAS LASER  
BEAM A66-28689
- DEGRADATION  
FOCUSED LASER COHERENT RADIATION-INDUCED  
DEGRADATION OF SOLID METHYLENE AND GAS  
CHROMATOGRAPHIC ANALYSIS OF REACTION PRODUCTS  
A66-31870
- DELAY LINE  
CONTINUOUSLY VARIABLE OPTICAL DELAY LINE USING  
ACOUSTIC WAVES TO DIFFRACT AND FREQUENCY SHIFT  
PORTION OF ARGON ION LASER BEAM A67-12517
- INTERNALLY SCANNED LASER BEAM HAVING HIGH  
DEFLECTION RATE PRODUCED BY PULSED OPTICAL DELAY  
LINE A67-16647
- DEMODULATION  
ANALYSIS OF FREQUENCY MODULATION AND DEMODULATION  
METHODS FOR CONTINUOUS WAVE LASERS IN TERMS OF  
AMPLITUDE NOISE SENSITIVITY  
NASA-CR-668 N67-17358
- DENSITY DISTRIBUTION  
HE- NE LASER HOMODYNE SPECTROMETER OBSERVATION OF  
BROADENING OF SPECTRAL PROFILE OF LIGHT SCATTERED  
FROM CARBON DIOXIDE NEAR CRITICAL TEMPERATURE AND  
DENSITY DUE TO DENSITY FLUCTUATIONS A66-26168
- KINETIC EQUATION DERIVATION FROM DENSITY MATRIX  
FOR CASE OF QUANTUM GENERATION OF SECONDARY  
OPTICAL HARMONIC IN LASER CAVITY UNDER VARIOUS  
OPTICAL PUMPING CONDITIONS A67-13127
- ACCURACY AND LIMIT ANALYSIS OF STATISTICAL  
DISTRIBUTION OF EM RADIATION FIELD BY  
PHOTOELECTRON COUNTING DISTRIBUTIONS FROM  
PHOTODETECTOR FOR SINGLE MODE LASER NEAR THRESHOLD  
A67-16624
- DETECTION  
DOPPLER LASER RADAR SYSTEM FOR DETECTION OF CLEAR  
AIR TURBULENCE  
SID-66-450 N66-35122
- DETONATION  
LEAD AZIDE AND PENTAERYTHRITE TETRANITRATE  
EXPLOSION TRIGGERED BY LASER RADIATION A67-19315
- DETONATION WAVE  
LASER LIGHT SOURCE CONTROLLED BY KERR CELL  
COUPLED WITH Z-TYPE SCHLIEREN OPTICAL SYSTEM TO  
PRODUCE MULTIPLE FLASH PHOTOGRAPHS OF DETONATION  
WAVE DEVELOPMENT A67-12227
- TRANSITION TO DETONATION IN GASEOUS MEDIUM  
EXPERIMENTALLY STUDIED, BASED ON SELF-SUSTAINED  
DETONATION FRONT AND ADAPTATION OF AMPLITUDE  
MODULATED GIANT PULSE LASER SYSTEM A67-13500
- DEUTERIUM  
DEUTERIUM ISOTOPE EFFECT ON THRESHOLDS OF EUROPIUM  
CHELATE LASERS, NOTING SOLVENT THERMAL EFFECTS  
A66-26598
- PLASMA PRODUCTION BY FIRING GIANT PULSE LASER AT  
SOLID DEUTERIUM PELLET /ICE/, NOTING STRONG  
ANISOTROPY IN PLASMA OUTBURST A66-36595
- DEUTERIUM PLASMA  
HIGH-TEMPERATURE RESEARCH WITH INFRARED MASER FOR

TIME-SPACE RESOLVED DIAGNOSTICS OF DEUTERIUM  
PLASMAS  
ARL-65-270 N66-30302

**DIAMOND**

LASER SYSTEM FOR DIAMOND PIERCING IN WIRE-DRAWING  
DIES AND CLOSED CIRCUIT TV VIEWING SYSTEM FOR  
MONITORING OPERATION A67-15309

**DIE**

LASER SYSTEM FOR DIAMOND PIERCING IN WIRE-DRAWING  
DIES AND CLOSED CIRCUIT TV VIEWING SYSTEM FOR  
MONITORING OPERATION A67-15309

**DIELECTRIC CONSTANT**

COUPLING AND SYNCHRONIZATION OF LASERS, NOTING  
FIELD AMPLITUDES, DELAYED INTERACTION AND  
DIELECTRIC CONSTANT DISPERSION A66-29885

FAR-FIELD LIGHT EMISSION MODE PATTERN OF GA AS  
DIODE INJECTION LASERS, DIELECTRIC GRADIENT IN  
INVERSION LAYER AND REFRACTIVE INDEX IN JUNCTION  
A66-39743

PARASITIC INTERNAL OSCILLATIONS IN LASER CRYSTAL  
WITH DIELECTRIC ROD CAUSED BY TOTAL REFLECTION  
FROM GENERATRIX OF CYLINDRICAL SAMPLE  
A66-41477

FREQUENCY MODULATION OF GA AS SEMICONDUCTOR LASER  
BY ULTRASONIC WAVE MODULATION OF DIELECTRIC  
CONSTANT A67-16671

**DIELECTRIC MATERIAL**

NONLINEAR DIELECTRIC LASER LIGHT ABSORPTION BY  
NEUTRAL GAS RESULTING IN AVALANCHE BREAKDOWN OF  
GAS DUE TO THERMAL IONIZATION A66-25425

LASER FREQUENCY TUNING BY DIELECTRIC MATERIAL  
INTERACTION TO PRODUCE NONLINEAR EFFECTS  
A66-26867

DIELECTRIC MATERIAL POSITION EFFECT ON  
CHARACTERISTICS OF LADDER LINE SLOW WAVE  
STRUCTURE OF TW MASERS A66-27960

ZERO MAGNETIC FIELD MILLIMETER MASER USING  
TRIVALENT IRON ION IN HOST CRYSTALLINE STRUCTURE  
OF RUTILE /TITANIUM DIOXIDE/ AS ACTIVE MATERIAL  
A66-29018

PHOTOCONDUCTIVITY INDUCED IN UNCOLORED SODIUM  
CHLORIDE AND ALUMINUM OXIDE SINGLE CRYSTALS BY  
RADIATION FROM RUBY LASER A66-33939

LASER GIANT PULSE DAMAGE TO DIELECTRIC MIRROR  
COATINGS IMMERSSED IN NITROBENZENE SOLUTION  
A66-36075

SELF-TRAPPING OF LASER BEAM DUE TO DIFFRACTION  
FROM DIELECTRIC WAVEGUIDE ARISING FROM  
PERMITTIVITY INCREASE OF BIREFRINGENT BEAM  
A66-42554

**DIELECTRICS**

DISPERSION CHARACTERISTIC OF STUB SLOW-WAVE  
STRUCTURE, PARTIALLY FILLED BY DIELECTRIC, OF  
TRAVELING WAVE MASER A66-28291

DISINTEGRATION OF ALKALI HALIDE SINGLE CRYSTALS,  
POLYMERS AND GLASSES UNDER LASER RADIATION, NOTING  
PARAMETERS OF DISINTEGRATION REGION MAGNITUDE  
A66-34681

PROPERTIES OF FINITE CYLINDRICAL DIELECTRIC  
RESONATOR - LASER OPTICS  
TG-230-T465 N66-34543

BEHAVIOR OF CIRCULAR DIELECTRIC RESONATOR UNDER  
SOME CRITICAL OPERATING CONDITIONS  
TG-230-T475 N66-34783

DISINTEGRATION OF ALKALI HALIDE SINGLE CRYSTALS,  
POLYMERS AND GLASSES UNDER LASER RADIATION, NOTING  
PARAMETERS OF DISINTEGRATION REGION MAGNITUDE  
A67-14367

**DIFFRACTION**

PARTIALLY COHERENT LIGHT DIFFRACTION CALCULATIONS

APPLIED TO RUBY LASER RADIATION  
TG-230-T478 N66-37071

**DIFFRACTION GRATING**

LIGHT TRANSMISSION THROUGH OPTICAL DIFFRACTION  
LATTICE CONSISTING OF MEDIUM IN EM FIELD OF  
LASER BEAM A66-28626

RADIATION CONTROL OF RUBY LASER BY DIFFRACTION  
MODULATOR WITH TRAVELING ULTRASONIC WAVE, NOTING  
COMPUTER SOLUTION OF KINETIC EQUATIONS OF  
POPULATION BALANCE, RADIATION DENSITY,  
CHARACTERISTIC DAMPING, ETC A66-33515

RADIATION CONTROL OF RUBY LASER BY DIFFRACTION  
MODULATOR WITH TRAVELING ULTRASONIC WAVE, NOTING  
COMPUTER SOLUTION OF KINETIC EQUATIONS OF  
POPULATION BALANCE, RADIATION DENSITY,  
CHARACTERISTIC DAMPING, ETC A66-42128

**DIFFRACTION PATH**

LASER MIRROR DESIGN IN LENS FORM FOR DECOUPLING  
DIFFRACTION LIMITED PARALLEL BEAM, BASED ON  
THEOREMS CONCERNING GAUSSIAN BEAM IMAGING AND  
BEHAVIOR A67-17327

**DIFFRACTION PATTERN**

OPTICAL RESONATOR DIFFRACTION LOSS, NOTING LASER  
OSCILLATIONS IN HIGH LOSS ARRANGEMENTS, OUTPUT  
BEAM POWER, FIELD PATTERNS, ETC  
A66-25195

LASER BEAMS AND RESONATORS, DISCUSSING BEAM  
PROPAGATION IN FREE SPACE, GEOMETRICAL OPTICS  
APPLICATION AND RESONATOR MODES IN VIEW OF  
APERTURE DIFFRACTION EFFECTS A66-42806

SECOND HARMONIC GENERATION OF LIGHT BY FOCUSED  
LASER BEAMS IN NONLINEAR CRYSTALS AT EXIT SURFACE  
A67-16640

**DIFFRACTION PROPAGATION**

DIFFRACTION LIMITED PERFORMANCE ACHIEVED FOR  
FLYING SPOT RECORDING AND READOUT, USING  
CONCENTRIC OPTICAL SYSTEM, APPLIED TO LASER  
SCANNER A67-15322

**DIFFUSE RADIATION**

TRANSFER EFFICIENCY OF LASER PUMPING CAVITIES WITH  
DIFFUSELY REFLECTING WALL DETERMINED, BASED ON  
APPROXIMATELY ISOTROPIC NATURE OF LIGHT INSIDE  
CAVITY A66-35379

SPATIAL COHERENCE OF LASER LIGHT BEAM AFTER  
EXTREME WAVEFRONT DISTORTIONS ON DIFFUSION  
EXPLAINED ON BASIS OF FRAUNHOFER AND FRESNEL  
DIFFRACTION A67-11062

FOURIER TRANSFORM HOLOGRAPHY FOR DIFFUSION OF  
COHERENT LASER LIGHT BEAM, EXAMINING DISTORTION  
TERM IN RECONSTRUCTED IMAGE A67-11063

**DIFFUSION COEFFICIENT**

CRYSTAL GROWTH, DIFFUSION AND FABRICATION OF  
GALLIUM ARSENIDE-PHOSPHIDE JUNCTION LASERS WITH  
LOW THRESHOLD CURRENT DENSITIES  
A66-37401

**DIFFUSION EFFECT**

FABRICATION OF GALLIUM ARSENIDE LASER DIODES BY  
DIFFUSION  
AD-478538 N66-28726

**DIFFUSION THEORY**

EFFECTIVE DIFFUSION CROSS SECTION OF ULTRASONIC  
AND LASER BEAM WHILE ACTING ON TURBULENT FLOW  
A66-25404

**DIGITAL COMPUTER**

LASER DIGITAL DEVICES, DISCUSSING USE AS SWITCHING  
CIRCUIT IN DIGITAL COMPUTER A67-19088

SEMICONDUCTOR LASERS FOR DIGITAL COMPUTER CIRCUITS  
N67-13063

**DIGITAL NAVIGATION SYSTEM**

DIGITAL-MODE FM CW LASER RANGING AND TRACKING  
SYSTEM USING COMPOUND AXIS SERVOMECHANISM  
A66-25982



## DIGITAL TECHNIQUE

RESEARCH PROGRAMS ON HOLOGRAPHY, INFRARED LASER,  
DIGITAL FILTER, ANTENNA TRACKING ACCURACY, PCM  
TELEMETRY, OPTICAL TRACKING CONTROL SYSTEM  
NASA-TM-X-55504 N66-31154

## DIODE

REPLACING HEATED TUNGSTEN FILAMENT AND IR FILTER  
BY GA AS ELECTROLUMINESCENT DIODE WITHOUT FILTER  
FOR IR ILLUMINATION A66-36266

OPTICAL COUPLING USING GALLIUM ARSENIDE LASER FOR  
VARIATION OF FREQUENCY OF DIODE EMISSION THROUGH  
SMALL CHANGE IN CURRENT DENSITY A66-38920

ROOM TEMPERATURE PERFORMANCE OF GA AS LASER  
DIODES, USING S C RS TO ACHIEVE HIGH PULSE  
REPETITION RATE A66-40175

SEMICONDUCTOR INJECTION LASERS  
REPT.-8 N66-27687

DOPING OF SEMICONDUCTORS BY ION BOMBARDMENT -  
MACHINING BY LASER BEAM - OSCILLATIONS AND  
CIRCUIT BEHAVIOR OF GUNN DIODES N66-35029

AVALANCHE TRANSISTOR PULSER DESIGNED TO DRIVE  
GA AS RADAR-LASER DIODE A67-12964

THRESHOLD CURRENT DENSITY DEPENDENCY ON PHOTON  
ENERGY IN GALLIUM ARSENIDE LASER DIODES A67-13480

OPTICAL COUPLING USING GALLIUM ARSENIDE LASER FOR  
VARIATION OF FREQUENCY OF DIODE EMISSION THROUGH  
SMALL CHANGE IN CURRENT DENSITY A67-16390

## DIPOLE MOMENT

DIPOLE MOMENT CALCULATION FOR GAS LASER IN  
MAGNETIC FIELD A66-29348

DIPOLE MOMENT CALCULATION FOR GAS LASER IN  
MAGNETIC FIELD A66-37353

## DISCHARGE

TUNABLE LASER BEAM FOR INVESTIGATING HIGHLY  
EXCITED STATES OF ATOMS IN DISCHARGE N66-36881

## DISCHARGE TUBE

HELIUM-NEON LASER MULTIBEAM GENERATION IN GAS  
DISCHARGE TUBE, USING SPHERICAL MIRRORS AND  
TAPERED PLATES A66-26053

CATAPHORESIS, MOVING STRIATIONS AND ASSOCIATED  
NOISE IN HE- NE LASER A66-26591

EFFECT OF LONGITUDINAL MAGNETIC FIELD ON OUTPUT  
POWER OF GAS LASER OPERATING IN IR SPECTRUM,  
NOTING GAS-MIXTURE PRESSURE IN DISCHARGE TUBE ROLE  
A66-27156

ALUMINA HIGH TEMPERATURE GAS DISCHARGE TUBE FOR  
INVESTIGATION OF PULSED METAL VAPOR LASER  
OSCILLATIONS A66-35810

COMPACT DISCHARGE LAMP DESIGNED FOR CONTINUOUS  
PUMPING OF SOLID STATE LASER, WITH INTEGRAL MOUNTS  
FOR CRYSTALS AND ENCLOSURE PROVIDING COOLING  
CIRCUITS FOR LAMP AND CRYSTAL A66-41247

EFFECT OF LONGITUDINAL MAGNETIC FIELD ON OUTPUT  
POWER OF GAS LASER OPERATING IN IR SPECTRUM,  
NOTING GAS-MIXTURE PRESSURE IN DISCHARGE TUBE  
A66-42977

TUBE DIAMETER INFLUENCE ON OUTPUT POWER AND  
EFFICIENCY OF GAS LASER A67-16629

IMPULSE DISCHARGE TUBES FOR LASER EMPLOYING  
INDUSTRIAL GLASS A67-19506

DISCHARGE TUBE DIMENSIONS, FLOW RATE, WALL  
TEMPERATURE, AND GAS MIXTURES DEFINED FOR CARBON  
DIOXIDE GAS LASER  
NASA-CR-81332 N67-16633

## DISINTEGRATION

DISINTEGRATION OF ALKALI HALIDE SINGLE CRYSTALS,  
POLYMERS AND GLASSES UNDER LASER RADIATION, NOTING  
PARAMETERS OF DISINTEGRATION REGION MAGNITUDE  
A66-34681

DISINTEGRATION OF ALKALI HALIDE SINGLE CRYSTALS,  
POLYMERS AND GLASSES UNDER LASER RADIATION, NOTING  
PARAMETERS OF DISINTEGRATION REGION MAGNITUDE  
A67-14567

CLEAVAGE AND SEPARATION OF DYE-DOPED ICE AND  
PARAFFIN INSTANTANEOUSLY HEATED BY LASER PULSE,  
MEASURING MECHANICAL PULSE AT ENERGY  
CONCENTRATIONS BELOW VAPORIZATION HEAT  
A67-18807

## DISPERSION

RUBY LASER GENERATION FROM TWO R LINES BY  
PRISMATIC LIGHT DISPERSION IN RESONATOR  
A67-13095

SELF-FOCUSING DUE TO INTENSITY DEPENDENT ANOMALOUS  
DISPERSION EFFECT ON ELECTROMAGNETIC RADIATION,  
EMPHASIZING LASER RADIATION IN SATURATED  
AMPLIFYING MEDIUM A67-16649

## DISPLAY SYSTEM

LARGE SCREEN REAL TIME PROJECTION DISPLAY  
TECHNIQUE USING NE- HE GAS LASER  
A66-31412

MODULATION AND SCANNING OF COHERENT LIGHT FOR  
APPLICATION TO SIMULATION DISPLAY GENERATION  
AMRL-TR-66-9 N66-39473

SELECTIVE ACCESS LASER DISPLAY BEAM POSITIONER  
RADC-TR-66-447 N67-15327

## DISTANCE MEASURING EQUIPMENT

MEASUREMENT OF DISTANCE TO MOON BY OPTICAL  
RADAR, DISCUSSING RUBY LASER/PHOTOMULTIPLIER  
APPARATUS AND PROCEDURE A66-30291

TOPOCENTRIC DISTANCE OF GEODETIC SATELLITE GEOS-  
A MEASURED BY LASER TELEMETRY FROM STATION  
A66-30586

ERROR DUE TO MULTIPLE PROPAGATION IN DISTANCE  
MEASUREMENT BY COMPARISON OF MODULATION PHASES ON  
TRANSMITTED AND REFLECTED LASER BEAM  
A67-19606

## DISTRIBUTION FUNCTION

MICROWAVE MODELS OF OPTICAL RESONATORS, DISCUSSING  
CORRECTION OF DISCREPANCIES RESULTING FROM  
APPROXIMATIONS IN MEASUREMENTS A66-26006

FOKKER- PLANCK EQUATION APPLIED TO LASER UNDER  
INFLUENCE OF QUANTUM FLUCTUATIONS CONNECTED WITH  
DISSIPATION, PUMPING AND CAVITY THERMAL NOISE,  
NOTING DISTRIBUTION AND CORRELATION FUNCTION  
A66-38930

REPLACEMENT OF POISSON BY POLYA DISTRIBUTION IN  
CALCULATING LASER INTENSITY THRESHOLD NECESSARY TO  
INDUCE IONIZATION BREAKDOWN IN GASES  
A66-39715

VELOCITY DISTRIBUTION FUNCTION MEASUREMENT OF GAS  
BASED ON LASER BEAM ATTENUATION  
SUDAAR-275 N67-18270

## DOCKING

LASER GUIDANCE SYSTEM FOR RENDEZVOUS AND DOCKING  
PROVIDING DATA ACQUISITION FOR GUIDANCE COMPUTER  
A67-15663

## DOG

CEREBRAL CORTEX OF DOG AS AFFECTED BY LASER  
RADIATION A66-82035

## DOPING

DOPING OF SEMICONDUCTORS BY ION BOMBARDMENT -  
MACHINING BY LASER BEAM - OSCILLATIONS AND  
CIRCUIT BEHAVIOR OF GUNN DIODES  
N66-35029

## DOPPLER EFFECT

OPTICAL- AND I R-MASER SPECTROSCOPY OF  
INHOMOGENEOUSLY BROADENED RESONANCES, USING GAS  
LASERS A66-26196

LASER DOPPLER VELOCIMETER FOR MEASURING LOCALIZED  
FLOW VELOCITIES IN LIQUIDS A66-27053

C AT DETECTION FROM DOPPLER SHIFT IN LASER LIGHT  
BACKSCATTERED FROM ATMOSPHERIC AEROSOL A66-28930

DOPPLER SHIFT AND HIGH VELOCITY MIRROR  
TRANSLATION EFFECTS ON MUTUAL OPTICAL COHERENCE  
FUNCTION OF GAS LASER MICHELSON INTERFEROMETERS  
A66-35387

LASER APPLICATION FOR VIBRATION MEASUREMENT  
UTILIZING DOPPLER SHIFT PRODUCED ON WAVE  
REFLECTED FROM SURFACE VIBRATING NORMAL TO BEAM  
PATH A66-35673

OPTICAL HETERODYNE RECEIVER ANTENNA PROPERTIES,  
NOTING EFFECTIVE APERTURE OF CAPTURE CROSS SECTION  
VS DIRECTIONAL TOLERANCE AND DETECTION OF DOPPLER  
SHIFTS IN LIQUID SCATTERED COHERENT LIGHT  
A66-42809

NONLINEAR ATTENUATION OR GAIN CHARACTERISTICS OF  
DOPPLER-BROADENED ATOMIC RESONANCE INVOLVING  
LEVELS WITH SMALL SPLITTINGS, NOTING MODE COUPLING  
OF GAS LASER A67-10152

OPTICAL FREQUENCY TRANSLATION OF PULSES FROM MODE  
LOCKED LASER, NOTING DOPPLER SHIFTS OF LARGE  
MAGNITUDE A67-12506

EFFECT OF DOPPLER AND IMPACT LINE BROADENING OF  
SPECTRAL CHARACTERISTICS OF GAS LASER, NOTING  
STANDING MONOCHROMATIC WAVE SATURATION  
A67-14197

GAS LASER SPECTROSCOPIC ANALYSIS OF HYPERFINE  
STRUCTURE, PARAMAGNETIC PROPERTIES, RADIATIVE  
LIFETIMES AND DOPPLER-BROADENED TRANSITION  
SATURATION BEHAVIOR OF EXCITED STATES OF Xe 129  
A67-15462

DOPPLER AND IMPACT BROADENING OF SPECTRAL LINES  
AND PRESSURE EFFECTS ON POWER OUTPUT OF GAS LASER  
A67-16643

## DOPPLER RADAR

LASER DOPPLER VELOCIMETER FOR GAS AND LIQUID FLOW  
VELOCITY MEASUREMENT A66-42557

## DOSIMETRY

BIOLOGICAL EFFECTS AND DOSIMETRY OF ABSORBED  
RADIATION FROM RUBY LASER N66-37710

## DOUBLE RESONANCE

NONEQUILIBRIUM POPULATION BUILDUP AND DETECTION  
FOR IR SOLID STATE LASERS AND I R-OPTICAL  
DOUBLE RESONANCE IN LANTHANUM CHLORIDE CRYSTAL  
A66-26177

## DRAG EFFECT

DRAG EFFECT OF GAS RING LASER ACTIVE MEDIUM  
NASA-TT-F-10693 N67-18935

## DRIFT RATE

TEMPERATURES, LORENTZIAN WIDTHS AND DRIFT  
VELOCITIES OF EXCITED NEUTRAL AND IONIC SPECIES IN  
ARGON-ION LASER, NOTING THERMAL EQUILIBRIUM  
ACHIEVEMENT A66-28695

## DRILL

SUPERPOWER LASERS AND MAGNETIC FIELD TOOLS FOR USE  
IN DRILLING AND WELDING N66-36423

## DUST

DUST PARTICLES IN LASER CAVITY OBSERVED FOR  
ANGULAR STABILIZATION AND CONSTANT VELOCITIES  
A66-26594

DETECTION OF CEMENT DUST CLOUDS WITH PULSED RUBY  
LIDAR  
UCRL-13204 N66-32847

## DYE

HOLE BURNING IN BLEACHABLE ABSORBERS USED AS LASER  
Q-SPOILER A66-29387

REVERSIBLE BLEACHABLE DYE-SOLUTIONS FOR EXPANDER  
ELEMENTS IN LASER A66-29388

Q-SWITCHED RUBY LASER OUTPUT INCREASED BY USE OF  
SATURABLE DYE SOLUTION IN LASER CAVITY A66-37290

RUBY LASER WHICH PRODUCES TRIGGERABLE GIANT LASER  
PULSES BY Q-SWITCHING WITH SELECTIVE SATURABLE  
ORGANIC DYE  
IPP-4/34 N66-28336

PUMPING OF ORGANIC DYES IN ORGANIC SOLVENTS, USING  
PULSED RUBY LASER A67-12515

## DYSPROSIUM

RUBY LASER RADIATION EFFECT ON FLUORESCENCE AND  
LASER ACTION IN DYSPROSIUM DOPED CALCIUM FLUORIDE  
CRYSTALS A66-37656

DYSPROSIUM DOPED CALCIUM FLUORIDE GIANT PULSE  
LASER WITH HIGH REPETITION RATE OBTAINED, USING  
DC PUMPING XENON LAMP A67-16674

## E

## EARTH ATMOSPHERE

SYSTEMS ANALYSES AND MODELS OF LASER TECHNIQUES  
DESIGNED TO DETECT INTERPLANETARY DUST IN  
ATMOSPHERE OF EARTH  
NASA-CR-80473 N67-13108

## EARTH ROTATION

ATOMIC MASER CLOCKS ROTATION WITH EARTH, DERIVING  
FORMULA FOR RELATIVE DRIFT AT WIDELY SEPARATED  
LOCALITIES ARISING FROM LOCAL GRAVITATIONAL  
POTENTIALS A66-30187

## EBERT SPECTROMETER

ABSORPTION COEFFICIENTS FOR ALPHA-POLARIZED  
RADIATION USING RUBY LASER AS COHERENT SOURCE AND  
EBERT SPECTROMETER AS INCOHERENT SOURCE  
TR-4 N66-34159

## ELECTRIC ARC

PULSED ARC XENON DISCHARGES USED FOR OPTICAL  
PUMPING OF HIGH ENERGY LASERS  
AD-632892 N66-31537

## ELECTRIC BREAKDOWN

NONLINEAR DIELECTRIC LASER LIGHT ABSORPTION BY  
NEUTRAL GAS RESULTING IN AVALANCHE BREAKDOWN OF  
GAS DUE TO THERMAL IONIZATION A66-25425

ELECTRICAL BREAKDOWN OF GASES BY OPTICAL FREQUENCY  
RADIATION, NOTING LASER BEAM ATTENUATION AND  
SUBSEQUENT ENERGY ABSORPTION BY PLASMA A66-26190

THRESHOLD DATA FOR RUBY AND NEODYMIUM LASER  
PULSE-INDUCED BREAKDOWN IN Xe, Ar, Kr, Ne,  
He, OXYGEN, NITROGEN, AIR AND CARBON DIOXIDE  
A66-26191

PLASMA RESONANCE AND SCATTERING, THRESHOLD  
VARIATION AND OPTICAL REFLECTIVITY IN PULSED LASER  
BEAM-INDUCED GAS BREAKDOWN A66-26192

GROWTH RATE OF IONIZATION BY ELECTRON IMPACT IN  
PRESENCE OF LASER BEAM, ELASTIC AND INELASTIC  
SCATTERING CROSS SECTIONS, FREE-FREE ABSORPTION,  
EXCITATION AND IONIZATION COEFFICIENTS, BREAKDOWN  
TIMES AND THRESHOLDS A66-26193

GIANT-PULSE LASER-INDUCED ATMOSPHERIC ELECTRIC  
BREAKDOWN CAUSING OPTICAL FREQUENCY DISCHARGE  
A66-26194

BREAKDOWN BY NEODYMIUM GLASS LASER RADIATION IN  
ATOMIC AND MOLECULAR GASES, DETERMINING POWER  
DENSITIES, NOTING RELATION OF PRESSURE TO  
BREAKDOWN POWER A66-30938

RUBY LASER INDUCED BREAKDOWN IN OXYGEN GAS AT HIGH  
PRESSURE N66-35531

- RESEARCH ON PLASMA STABILITY, BEAM INTERACTIONS,  
AND ELECTRIC BREAKDOWN OF GAS BY LASER  
EUR-CEA-FC-352 N67-14307
- ELECTRIC CURRENT**  
CURRENT CHANGES IN GAS DISCHARGE AS AFFECTED BY  
LASING ACTION A66-27055
- HIGH CURRENT DISCHARGE EFFECT ON MAGNETICALLY  
CONFINED ARGON LASER A67-10012
- ELECTRIC DIPOLE**  
NONLINEAR OPTICS EMPHASIZING PARAMETRIC  
OSCILLATION, SELF-FOCUSING AND TRAPPING OF LASER  
BEAMS AND STIMULATED RAMAN, RAYLEIGH AND  
BRILLOUIN SCATTERING, USING MAXWELL EQUATIONS  
AND ELECTRIC DIPOLE APPROXIMATION A66-42810
- ELECTRIC DISCHARGE**  
GIANT-PULSE LASER-INDUCED ATMOSPHERIC ELECTRIC  
BREAKDOWN CAUSING OPTICAL FREQUENCY DISCHARGE  
A66-26194
- DIRECT CURRENT PUMPING AND COMBINED MICROWAVE  
ELECTRON-CYCLOTRON RESONANCE WITH DIRECT CURRENT  
PUMPING EFFECTS ON DISCHARGE BEHAVIOR AND ARGON  
LASER OPERATION  
REPT.-2 N66-29240
- HIGH CURRENT DISCHARGE EFFECT ON MAGNETICALLY  
CONFINED ARGON LASER A67-10012
- ELECTRON TEMPERATURE IN ELECTRIC DISCHARGE  
APPLIED TO ARGON ION LASER A67-10550
- ELECTRON TEMPERATURE IN ELECTRIC DISCHARGE APPLIED  
TO ARGON ION LASER A67-11058
- NITRIC OXIDE MOLECULAR LASER OBTAINED BY  
DISSOCIATION OF N O- CL IN PULSED ELECTRICAL  
DISCHARGE A67-12510
- ELECTRIC FIELD**  
SPATIAL DISTRIBUTION OF ELECTRICAL FIELD OBTAINED  
BY FOCUSING RADIATION OF RUBY LASER  
A66-25967
- RESONANT BIREFRINGENCE IN POTASSIUM VAPOR UNDER  
INFLUENCE OF ELECTRIC FIELD OF RUBY LASER EMISSION  
A66-36066
- SPHERICAL COUPLER FOR FASTENING MIRRORS AND PLANE-  
PARALLEL PLATES AT BREWSTER ANGLE IN GAS LASER  
A66-37523
- MODE COUPLING IN RUBY LASER WITH REACTANCE PLACED  
WITHIN CAVITY RESONATOR WITH MODULATION FREQUENCY  
CLOSE TO SEPARATION OF AXIAL MODES, EXAMINING  
ELECTRIC FIELD ENVELOPE A66-42565
- CONTROLLED THERMONUCLEAR STUDIES - CAULKED STUFFED  
CUSP MINIMUM- B MACHINE, SCYLLA OPERATION AND  
MEASUREMENTS, RUBY LASER TESTING, PLASMA GUNS,  
AND ELECTRIC AND MAGNETIC FIELD MEASUREMENTS  
LA-3434-MS N66-25226
- MASER OSCILLATION INTENSITY AND FREQUENCY  
DEPENDENCE ON CONSTANT ELECTRIC AND MAGNETIC  
FIELDS ACTING ON MOLECULAR BEAM IN FRONT OF  
RESONATOR A67-10396
- SPHERICAL COUPLER FOR FASTENING MIRRORS AND PLANE-  
PARALLEL PLATES AT BREWSTER ANGLE IN GAS LASER  
A67-18394
- ELECTRIC MEASUREMENT**  
CURRENT MEASURING DEVICE FOR EHV TRANSMISSION  
LINE, OBTAINING INSTANTANEOUS MAGNETIC FIELD BY  
GAUGING FARADAY ROTATION ANGLE OF LASER BEAM IN  
FLINT GLASS ROD A66-42556
- ELECTRIC PULSE**  
ION LASER EXPERIMENTS, MOLECULAR NITROGEN LASER,  
AND GAS LASER THEORY N67-12649
- ELECTRO-OPTICS**  
COHERENT TRANSMISSION OF OPTICAL RADAR FROM LASER  
SOURCE AND USE OF RF SUBCARRIERS PLACED ON
- OPTICAL BEAMS FOR WIDEBAND COMMUNICATIONS PURPOSES  
A66-28404
- STATIC CHARACTERISTICS OF GAS LASER INTERNAL  
MODULATION CIRCUIT, USING ELECTRO-OPTICAL CRYSTAL  
INSERTED INTO GAS LASER RESONATOR A66-32225
- RETARDATION-TYPE LASER MODULATORS, EXAMINING  
DRIVING POWER, TRANSMISSION AND DYNAMIC RANGE  
A66-32820
- OPTICAL MODULATION IN BULK GALLIUM ARSENIDE, USING  
GUNN EFFECT A66-33606
- BOOK ON LASER RECEIVERS COVERING NOISE  
PERFORMANCE, ATMOSPHERIC EFFECTS, DETECTION  
TECHNIQUES, HARDWARE AND SYSTEMS AVAILABLE,  
OPTICAL COMMUNICATION IN VISIBLE AND IR SPECTRUM,  
ETC A66-36060
- Q MODULATION OF LASER THEORY AND APPLICATION,  
PRESENTING GIANT PULSE PRODUCTION,  
PHENOMENOLOGICAL THEORY, OUTPUT RESPONSE TO STEP  
FUNCTION CHANGE, ELECTRO-OPTIC AND MECHANICAL  
MODULATORS A66-36971
- DYNAMIC LASER WAVELENGTH SELECTION BY INSERTION OF  
DISPERSIVE TUNABLE ELECTRO-OPTIC Q-SPOILER WITHIN  
LASER CAVITY A66-40866
- GA AS CRYSTAL AS ELECTRO-OPTIC MODULATOR AT 10.6  
MICRONS DUE TO SMALL CARRIER ABSORPTION, FREEDOM  
FROM INTERBAND TRANSITIONS AND HIGH RESISTIVITY  
A66-42553
- ELECTRO-OPTIC LIGHT MODULATION USING POCKEL AND  
KERR EFFECTS IN CRYSTALS FOR COMMUNICATIONS  
APPLICATIONS, USING LASERS A66-42811
- OPTICAL MODULATOR USING ELECTRO-OPTIC EFFECT IN  
LITHIUM TANTALATE FOR PCM TRANSMISSION SYSTEMS  
OPERATING AT 224 MEGACYCLE BIT RATE  
A67-10013
- VOICE COMMUNICATIONS SYSTEM USING GA AS ROOM-  
TEMPERATURE INJECTION LASER AND TV COMMUNICATIONS  
SYSTEM USING GA AS CRYSTALS AS MODULATORS FOR  
LASER BEAMS A67-11786
- RUBY AND NEODYMIUM GLASS LASERS SUM FREQUENCY  
GENERATION USING NONLINEAR ELECTRO-OPTICAL KDP  
CRYSTAL A67-17754
- ELECTRO-OPTIC INTRA-CAVITY COLOR SWITCHING IN  
KRYPTON ION FABRY-PEROT LASER A67-17888
- ELECTRO-OPTIC LIGHT MODULATORS OF LASER BEAMS  
NASA-TN-D-3678 N67-10788
- CONFERENCE PAPERS ON ELECTRO-OPTICAL DEVICES AND  
TECHNIQUES IN COMMUNICATIONS, INSTRUMENTATION,  
GUIDANCE, AND RADAR  
AGARD-CP-5 N67-13061
- OPTO-ELECTRONIC AIRCRAFT ALTIMETER CONCEPT BASED  
ON PROPERTIES OF ELECTRON INJECTION LASERS AND  
SILICON PHOTODIODES N67-13079
- ELECTROACOUSTIC WAVE**  
THEORY AND EXPERIMENTS IN MICROWAVE PROPAGATION  
AND AMPLIFICATION USING SOLID STATE DEVICES, AND  
CALCULATIONS OF ELECTRONIC DEFLECTION OF LASER  
BEAMS  
NASA-CR-80727 N67-13665
- ELECTROCHEMICAL OXIDATION**  
SOLID STATE REDUCTION OF LANTHANIDE IONS IN LASER  
HOSTS, EFFECT OF PRESENCE OF RECOMBINATION HOLE-  
CENTERS IN PHOTOREDUCED SAMPLES AND ELIMINATION  
DURING ELECTROCHEMICAL PROCESS A66-27464
- ELECTROLUMINESCENCE**  
REPLACING HEATED TUNGSTEN FILAMENT AND IR FILTER  
BY GA AS ELECTROLUMINESCENT DIODE WITHOUT FILTER  
FOR IR ILLUMINATION A66-36266
- ELECTROLUMINESCENCE, DISCUSSING SEMICONDUCTOR

- LASERS WITH VARIOUS EXCITATION SOURCES,  
LUMINESCENT EFFICIENCY, ETC A67-17889
- ELECTROMAGNETIC FIELD**  
QUANTUM THEORY OF LASERS PRESENTED IN TERMS OF  
CORRELATION FUNCTIONS OF SECOND-QUANTIZED  
ELECTROMAGNETIC AND MATTER FIELDS A66-26214
- LIGHT TRANSMISSION THROUGH OPTICAL DIFFRACTION  
LATTICE CONSISTING OF MEDIUM IN EM FIELD OF  
LASER BEAM A66-28626
- DERIVATION OF TWO EQUATIONS FOR ELECTROMAGNETIC  
FIELD AND POPULATION INVERSION IN SOLID STATE  
LASER A66-35370
- INTERBAND ELECTRON ABSORPTION AND DISPERSION  
DURING ONE- AND TWO-PHOTON PROCESSES IN  
SEMICONDUCTORS SUBJECTED TO ELECTROMAGNETIC FIELD,  
NOTING LASER APPLICATIONS A67-18798
- AUTOMATIC LASER BEAM DETECTOR AND INSTANTANEOUS  
TRANSVERSE ELECTROMAGNETIC MODE ANALYSIS OF  
HELIUM-NEODYMIUM LASER N67-16952
- ELECTROMAGNETIC INTERACTION**  
MODELS OF MATTER-ELECTROMAGNETIC FIELD INTERACTION  
FOR GAS LASERS, USING PERTURBATION THEORY A66-26216
- HIGH FREQUENCY-STABILITY EM WAVE SOURCE, APPLYING  
THERMAL EXCITATION METHODS TO PENCIL QUANTUM  
GENERATOR IN IR REGION A66-39336
- HIGH FREQUENCY-STABILITY EM WAVE SOURCE, APPLYING  
THERMAL EXCITATION METHODS TO PENCIL QUANTUM  
GENERATOR IN IR REGION A66-39706
- LINEARLY AND CIRCULARLY POLARIZED FIELDS IN LASER  
AMPLIFIER INTERACTION WITH AXIAL MAGNETIC FIELD,  
EMPHASIZING COMBINATION TONE PRODUCTION A66-41624
- ELECTROMAGNETIC MEASUREMENT**  
SAGNAC EFFECT - INTERFEROMETER OR RING LASER FOR  
ELECTROMAGNETIC SENSING OF ABSOLUTE ROTATION  
AFRL-66-311 N66-39733
- ELECTROMAGNETIC RADIATION**  
RING LASER ROTATION RATE SENSOR NOTING RELATION TO  
ELECTROMAGNETIC RADIATION A66-42564
- MATHEMATICAL DEVELOPMENT OF RESONANT FREQUENCIES  
OF ELECTROMAGNETIC CAVITY - EVALUATION OF  
OPTICAL LASER PHOTON RATE GYROSCOPE  
NASA-CR-59809 N66-33411
- SELF-FOCUSING DUE TO INTENSITY DEPENDENT ANOMALOUS  
DISPERSION EFFECT ON ELECTROMAGNETIC RADIATION,  
EMPHASIZING LASER RADIATION IN SATURATED  
AMPLIFYING MEDIUM A67-16649
- ELECTROMAGNETIC WAVE**  
P-N JUNCTION, ELECTROMAGNETIC WAVES OF GALLIUM  
ARSENIDE SEMICONDUCTOR LASER  
FTD-TT-65-891/18264 N66-30510
- DESIGNS OF QUANTUM ELECTRONIC SYSTEMS - RUBY  
LASERS, QUANTUM AND OPTICAL GENERATORS, OPTICAL  
GATES, WAVEGUIDES, ELECTROMAGNETIC WAVE  
PROPAGATION, AND COMMUNICATION SYSTEMS  
JPRS-37132 N66-37709
- RADIO ELECTRONICS, DISCUSSING QUANTUM ELECTRONICS,  
LASERS, MICROWAVE DEVICES AND TECHNOLOGY, PLASMA  
PHYSICS, ETC A67-18072
- ELECTROMOTIVE FORCE**  
PHOTO EMF VARIATION WITH RADIATION POWER OF  
Q-SWITCH RUBY LASER INCIDENT ON SILICON CRYSTAL  
WITH P-N JUNCTION A66-32509
- ELECTRON AVALANCHE**  
AVALANCHE TRANSISTOR PULSER DESIGNED TO DRIVE  
GA AS RADAR-LASER DIODE A67-12964
- ELECTRON BEAM**  
ELECTRON-BEAM-CONTROLLED CRT SCANLASER
- A66-25557
- STIMULATED EMISSION FROM ELECTRON BEAM EXCITATION  
OF TELLURIUM AND PURE AND N-TYPE DOPED INDIUM  
ANTIMONIDE IN SEMICONDUCTOR LASERS A66-26179
- Q-SWITCHED LASERS, INTERACTION OF HIGH POWER LIGHT  
PULSE WITH MATTER AND SEMICONDUCTOR LASERS PUMPED  
WITH OPTICAL RADIATION AND ELECTRON BEAMS  
INVESTIGATED, USING QUANTUM OSCILLATOR AND  
AMPLIFIER A66-26180
- EXCITATION IN ELECTRON BEAM PUMPED / EBP/ GA AS  
LASERS INCLUDING ELECTRON SCATTERING, ENERGY  
DISSIPATION PATTERN, PHONON EMISSION, PAIR  
PRODUCTION, ETC A66-26181
- SEMICONDUCTOR LASERS WITH HIGH POWER EFFICIENCY  
OBTAINED VIA ELECTRON BEAM EXCITATION ON CRYSTALS  
OF MIXED CADMIUM-SULFIDE-SELENIDE ALLOY A66-31533
- LASER BASED ON EXCITATION OF GALLIUM PHOSPHORUS  
ARSENIDE SOLID SOLUTION BY BEAM OF FAST ELECTRONS  
A66-33304
- FORCED EMISSION FROM ELECTRON-EXCITED CADMIUM  
SELENIDE A66-35788
- PULSED OPERATION OF ELECTRON-BEAM PUMPED ZINC  
OXIDE LASER EMITTING RADIATION IN UV AT VERY LOW  
TEMPERATURES, NOTING IMPORTANCE OF USE OF CAVITY  
A66-37768
- ELECTRON BEAM SCANLASER BASED ON LASER CAVITY  
DIRECTLY AND/OR TRANSVERSELY DEGENERATE HAVING Q-  
SPOILED FOR ALL MODES BUT ONE A66-38244
- CHARACTERISTICS OF EFFICIENT SEMICONDUCTOR LASERS  
IN UV PORTION OF SPECTRUM OBTAINED AT BOTH LIQUID  
HELIUM AND NITROGEN TEMPERATURES, USING PULSED  
ELECTRON BEAM EXCITATION ON ZN S CRYSTALS  
A66-39114
- EXTREMELY WIDEBAND INFORMATION STORAGE AND  
RETRIEVAL SYSTEMS EMPLOYING LASER OR ELECTRON  
BEAM ON SILVER HALIDE OR ELECTRON BEAM ON  
THERMOPLASTIC FILM A67-11437
- LASER BASED ON EXCITATION OF GALLIUM PHOSPHORUS  
ARSENIDE SOLID SOLUTION BY BEAM OF FAST ELECTRONS  
A67-11824
- LASER, ELECTRON AND PLASMA ENERGY BEAM TYPES AND  
APPLICATION TO MANUFACTURING TECHNOLOGY A67-12179
- STIMULATED EMISSION BY ELECTRON BEAM BOMBARDMENT  
OF LASER MATERIALS A67-14394
- ANNUAL ELECTRON AND LASER BEAM SYMPOSIUM,  
UNIVERSITY OF MICHIGAN, ANN ARBOR, APRIL 1966  
A67-15300
- SEMICONDUCTOR LASERS WITH RADIATING MIRRORS  
DEVELOPED BY EXCITATION, USING ELECTRON BEAM AND  
NEODYMIUM LASER GLASS RADIATION A67-16669
- ELECTRON BEAM SPATIAL SCANNING OF COHERENT  
EMISSION OF GA AS JUNCTION LASER AT LOW  
TEMPERATURES, MAKING CURRENT DISTRIBUTION  
NONUNIFORM A67-18150
- ELECTRON BEAM MELTING AND FLOAT ZONE CRYSTAL  
GROWTH TECHNIQUES FOR PROCESSING ALUMINUM OXIDE  
AND RELATED MATERIALS USED IN LASER TECHNOLOGY  
AFRL-66-473 N67-10948
- ELECTRON BOMBARDMENT**  
SUPERRADIANCE IN N-TYPE GALLIUM ARSENIDE AT ROOM  
TEMPERATURE EXCITED BY ELECTRON BEAM A66-27028
- LASER OSCILLATIONS IN CD SE AND CD S BOMBARDED  
BY FAST ELECTRON BEAM A66-27031
- LASER EMISSION IN PURE CADMIUM SULFIDE CRYSTALS

- BOMBARDED BY ELECTRON BEAMS A67-12812
- FAR FIELD PATTERN OF SHEET-LIKE LASER BEAM FROM ELECTRON BOMBARDED CD S AND ZN O SINGLE CRYSTALS A67-19798
- ELECTRON COLLISION**  
ELECTRON COLLISION RATE AND DENSITY CALCULATIONS FOR HE- NE LASER PLASMA A67-16598
- ELECTRON DECAY TIME**  
ELECTRON AND NEUTRAL ATOM DENSITIES IN HELIUM AND ARGON AFTERGLOW PLASMA OBTAINED BY TWO HELIUM-NEON LASER INTERFEROMETERS, NOTING TEMPORAL DEPENDENCE OF ELECTRON DECAY A66-41364
- ELECTRON DENSITY**  
CROSS SECTION FOR INELASTIC SCATTERING OF ELECTROMAGNETIC RADIATION BY ELECTRON DENSITY FLUCTUATIONS IN ANISOTROPIC SOLIDS, USING LASER SOURCES, INVESTIGATING LANDAU AND COLLISION DAMPING OF PLASMONS A66-26153
- HELIUM-NEON GAS LASER USED TO DETERMINE ELECTRON DENSITY VARIATION, SPATIAL AND TEMPORAL, IN AFTERGLOW OF Z-PINCH IN H AT 100 MTORR A66-26239
- LASER BEAM TECHNIQUES FOR STUDY OF PLASMAS WITH HIGH ELECTRON DENSITIES A66-26822
- LASER RADIATION TO DETERMINE ELECTRON DENSITY IN DENSE HIGH TEMPERATURE PLASMA A66-27507
- ELECTROSTATIC PROBE MEASUREMENTS OF VELOCITY DISPLACEMENT AND ELECTRON DENSITY OF PLASMA USING LASER COMPARED WITH MEASUREMENTS USING MICROWAVE INTERFEROMETER A66-28269
- ELECTRON DENSITY IN LASER-INDUCED SPARK IN AIR DETERMINED, MEASURING SIMULTANEOUSLY FUNDAMENTAL LASER WAVELENGTH AND SECOND HARMONIC A66-28685
- HELIUM-NEON LASER INTERFEROMETERS TO OBTAIN ELECTRON AND NEUTRAL ATOM DENSITIES IN HELIUM AND ARGON AFTERGLOW PLASMAS AROD-4832-7 N66-25866
- THREE-MIRROR LASER INTERFEROMETER MEASURING ELECTRON DENSITIES IN REPETITIVELY PULSED PLASMAS A67-11875
- ELECTRON DENSITY, OPTICAL THICKNESS AND TEMPERATURE OF RUBY LASER-INDUCED CARBON PLASMA A67-16654
- ELECTRON DENSITIES IN HELIUM PLASMA MEASURED BY LASER AMPLIFIER WITH MAXIMUM GAIN AND MINIMUM BANDWIDTH AT POINT NEAREST THRESHOLD A67-16663
- SPATIALLY RESOLVED HE- NE LASER HETERODYNE MEASUREMENTS OF ELECTRON NUMBER DENSITIES IN WEAKLY IONIZED AR PULSED DISCHARGES A67-17272
- DOUBLE PROBE AND MICROWAVE RESONANCE MEASUREMENTS OF GAS ADDITIVES EFFECT ON RADIAL VARIATION OF ELECTRON TEMPERATURE AND DENSITY WITH PARTIAL PRESSURES IN CARBON DIOXIDE-NITROGEN-HELIUM GAS LASER A67-17274
- OPTICAL HETERODYNE SYSTEM USED TO MEASURE ELECTRON DENSITY OF PLASMA NASA-CR-79511 N67-11738
- LASER MEASUREMENT OF ELECTRON DENSITY IN DENSE, HIGH TEMPERATURE PLASMA N67-13686
- HELIUM-NEON LASER USED WITH VARIOUS INTERFEROMETERS TO MEASURE RAPID ELECTRON DENSITY CHANGES IN ARGON PLASMA N67-15240
- ELECTRON DENSITY PROFILE**  
SPECTRAL ANALYSIS OF LASER DISCHARGE IN PURE AND IMPURE HE, OBTAINING SPECTRA OF SPARK AT VARIOUS PRESSURES, DETERMINING ELECTRON CONCENTRATION AT
- VARIOUS STAGES A66-40946
- ELECTRON DIFFRACTION**  
TRIVALENT NEODYMIUM DOPED GLASS LASER WITH INTERNAL IMPERFECTIONS DUE TO OPTICAL PUMPING EXAMINED VIA OPTICAL METALLOGRAPHY, TRANSMISSION ELECTRON MICROSCOPY AND ELECTRON DIFFRACTION TECHNIQUES A67-14927
- ELECTRON DISTRIBUTION**  
ELECTRON-ION EMISSION PATTERN DISTRIBUTION OBTAINED BY PULSED LASER FOCUSING ON SOLID TARGET A66-33256
- ELECTRON EMISSION**  
TIME RESOLUTION OF LASER-INDUCED ELECTRON EMISSION FROM CESIUM DIODE AT HIGH LASER POWER A66-31135
- LASER INDUCED SPONTANEOUS ELECTRON EMISSION FROM REAR SIDE OF METAL FOILS, NOTING ELECTRON ENERGY VS LASER ENERGY PULSE MAGNITUDE, ETC A66-31536
- CONTINUOUS HELIUM-NEON LASER USED TO OBTAIN SHORT INTENSE LIGHT PULSES AND TO STUDY KINETICS OF AUTOPHOTOELECTRONIC EMISSION OF HIGH RESISTIVITY SILICON A67-13142
- ELECTRON ENERGY**  
RUBY PHOSPHORESCENCE UNDER INTENSE OPTICAL EXCITATION, INFERRING POSSIBLE RECOMBINATION CHARACTERISTICS FROM INITIAL BRIGHTNESS DECAY A66-28607
- LASER INDUCED SPONTANEOUS ELECTRON EMISSION FROM REAR SIDE OF METAL FOILS, NOTING ELECTRON ENERGY VS LASER ENERGY PULSE MAGNITUDE, ETC A66-31536
- ELECTRON GAS**  
LASER OSCILLATION EFFECT ON CHARACTERISTICS OF ELECTRON GAS OF HELIUM-NEON LASER PLASMA STUDIED IN TERMS OF WAVE ATTENUATION IN PLASMA GUIDE A66-43006
- SPECTROSCOPIC AND MICROWAVE INVESTIGATION OF LASERING PLASMAS, ELECTRON GAS, AND EXCITED STATE POPULATIONS OF ACTIVE MEDIUM AFCRL-66-89 N66-26570
- ELECTRON IMPACT**  
ELECTRON IMPACT EXCITATION MECHANISM OF ARGON-ION CONTINUOUS AND LONG PULSE LASERS A66-26206
- GAS DISCHARGE BY LASER PULSE, TAKING INTO ACCOUNT PHOTOIONIZATION DUE TO ELECTRON IMPACT A66-41094
- ELECTRON IONIZATION**  
GROWTH RATE OF IONIZATION BY ELECTRON IMPACT IN PRESENCE OF LASER BEAM, ELASTIC AND INELASTIC SCATTERING CROSS SECTIONS, FREE-FREE ABSORPTION, EXCITATION AND IONIZATION COEFFICIENTS, BREAKDOWN TIMES AND THRESHOLDS A66-26193
- EXPERIMENTAL EVIDENCE OF INVERSE BREMSSTRAHLUNG AND ELECTRON-IMPACT IONIZATION IN LOW PRESSURE ARGON IONIZED BY GIANT PULSE LASER A66-29115
- ELECTRON MICROSCOPY**  
TRIVALENT NEODYMIUM DOPED GLASS LASER WITH INTERNAL IMPERFECTIONS DUE TO OPTICAL PUMPING EXAMINED VIA OPTICAL METALLOGRAPHY, TRANSMISSION ELECTRON MICROSCOPY AND ELECTRON DIFFRACTION TECHNIQUES A67-14927
- ELECTRON MOBILITY**  
RADIATIVE CORRECTIONS TO THOMSON SCATTERING IN LASER BEAMS ARISING FROM DAMPING OF ELECTRON MOTION AND PHOTON DENSITY, USING QUANTUM MECHANICS A66-30628
- SIGNAL EXCITATION IN NEGATIVELY CHARGED ANTENNA ROD IN EFFECT OF UNFOCUSED LASER BEAM A66-42753

- SIGNAL EXCITATION IN NEGATIVELY CHARGED ANTENNA  
ROD IN EFFECT OF UNFOCUSED LASER BEAM A67-10835
- OPTICAL NONLINEARITIES DUE TO CONDUCTION BAND  
ELECTRONS IN IN AS, IN SB, GA AS AND PB TE  
STUDIED, USING Q-SWITCHED CARBON DIOXIDE LASER  
RADIATION A67-12524
- OPTICAL MIXING DUE TO CONDUCTION BAND ELECTRONS IN  
SEMICONDUCTOR A67-12525
- TUNABLE RAMAN LASER OBTAINED BY ELECTRON  
MOBILITY SUBJECTED TO MAGNETIC FIELD, NOTING  
THRESHOLD PUMP POWER A67-16684
- INELASTIC SCATTERING OF CARBON DIOXIDE LASER  
RADIATION BY MOBILE LANDAU-LEVEL ELECTRONS IN N-  
IN SB A67-17723
- ELECTRON ORBIT**  
ULTRAVIOLET RADIATION FOR RUBY LASER PUMPING, AND  
ENERGY TRANSFER PROCESSES BETWEEN ELECTRON  
ORBITS AND BETWEEN UNLIKE IONS  
ML-1393 N66-24104
- ELECTRON PARAMAGNETIC RESONANCE**  
MASER MATERIAL IRON DOPED RUTILE, EXAMINING  
THEORETICAL AND EXPERIMENTAL DISAGREEMENT IN SPIN  
HAMILTONIAN DESCRIBING PARAMAGNETIC BEHAVIOR  
A66-29027
- POLYMETHYLMETHACRYLATE AND POLYSTYRENE EXPOSURE  
TO RUBY AND NEODYMIUM-GLASS LASER RADIATION,  
NOTING APPEARANCE OF EPR A67-10075
- ELECTRON-PHONON INTERACTION**  
SCATTERING OF LIGHT FROM PULSED RUBY LASER BY  
PLASMA JET, NOTING CROSS SECTION, ELECTRON-PHONON  
INTERACTION, ETC A66-30139
- ELECTRON RECOMBINATION**  
OPTICAL EMISSION FROM RUBY INDUCED BY SHORT  
PULSES OF RELATIVISTIC ELECTRONS IN WHICH  
ELECTRON-HOLE RECOMBINATION PRODUCES EXCITATION OF  
EMISSION A66-26173
- ELECTRON AND NEUTRAL ATOM DENSITIES IN HELIUM AND  
ARGON AFTERGLOW PLASMA OBTAINED BY TWO HELIUM-NEON  
LASER INTERFEROMETERS, NOTING TEMPORAL DEPENDENCE  
OF ELECTRON DECAY A66-41364
- ELECTRON RECOMBINATION IN LASER PRODUCED HYDROGEN  
DISCHARGE, NOTING TEMPERATURE DECAY DUE TO  
RADIATION, EXPANSION COOLING AND ELECTRON LOSS  
A67-15109
- ELECTRON SCATTERING**  
SCATTERING OF ELECTRON BEAM BY STANDING WAVES OF  
PHOTONS INSIDE LASER CAVITY CORRESPONDS TO  
STIMULATED COMPTON EFFECT A66-26155
- EXCITATION IN ELECTRON BEAM PUMPED / EBP/ GA AS  
LASERS INCLUDING ELECTRON SCATTERING, ENERGY  
DISSIPATION PATTERN, PHONON EMISSION, PAIR  
PRODUCTION, ETC A66-26181
- PHYSICS LECTURE SUMMARIES INCLUDING LASER BEAMS,  
ELECTRON SCATTERING, PARAMAGNETIC RESONANCE,  
PARTICLE ABSORPTION, CHROMOSOMES, AND RELATIVITY  
ISS-66/19 N66-35043
- INTERBAND ELECTRON ABSORPTION AND DISPERSION  
DURING ONE- AND TWO-PHOTON PROCESSES IN  
SEMICONDUCTORS SUBJECTED TO ELECTROMAGNETIC FIELD,  
NOTING LASER APPLICATIONS A67-18798
- ELECTRON SOURCE**  
LOCAL LASER HEATING OF CATHODE FOR ELECTRON  
EXTRACTION FROM PLASMOID A66-29879
- ELECTRON TEMPERATURE**  
ELECTRON TEMPERATURE AND CONCENTRATION IN DC  
PLASMA ARC DETERMINED FROM THOMSON SCATTERING OF  
LASER RADIATION A66-33840
- ELECTRON THERMALIZATION EFFECT ON SEMICONDUCTOR  
LASER BEHAVIOR, NOTING OPTICAL TRANSITION BETWEEN  
IMPURITY LEVEL AND BAND, TAKING INTO ACCOUNT
- DIFFUSION PROCESS A66-40790
- LANGMUIR PROBE USE FOR ELECTRON TEMPERATURE  
DETERMINATION IN LASER-INDUCED PLASMA  
BRL-MR-1715 N66-28920
- LASER ACTION BY RAPID ELECTRON COOLING OF IONIZED  
DENSE HYDROGEN PLASMA N66-32700
- ELECTRON TEMPERATURE IN ELECTRIC DISCHARGE  
APPLIED TO ARGON ION LASER A67-10550
- THERMALIZATION RATE OF HIGHLY IONIZED PLASMA WITH  
INITIALLY HOT IONS AND COLD ELECTRONS, USING LASER  
SCATTERING TO OBSERVE TIME VARIATION OF ELECTRON  
TEMPERATURE A67-10912
- ELECTRON TEMPERATURE IN ELECTRIC DISCHARGE APPLIED  
TO ARGON ION LASER A67-11058
- ELECTRON TEMPERATURE AND CONCENTRATION IN DC  
PLASMA ARC DETERMINED FROM THOMSON SCATTERING OF  
LASER RADIATION A67-13209
- DOUBLE PROBE AND MICROWAVE RESONANCE MEASUREMENTS  
OF GAS ADDITIVES EFFECT ON RADIAL VARIATION OF  
ELECTRON TEMPERATURE AND DENSITY WITH PARTIAL  
PRESSURES IN CARBON DIOXIDE-NITROGEN-HELIUM GAS  
LASER A67-12724
- ELECTRON TRANSITION**  
LASER OSCILLATOR STUDY OF COHERENT STIMULATED  
EMISSION OF IR TRANSITIONS IN RARE GASES A66-27336
- ISOTOPE SHIFTS AND FERMI RESONANCE ROLE IN CARBON  
DIOXIDE IR LASER A66-30176
- COMPETITION OF TRANSITIONS AND EMISSION IN HE- NE  
LASER, USING RESONATOR WITHOUT DISPERSING PRISM  
A66-33514
- LASER ACTION ON SEVERAL HYPERFINE TRANSITIONS IN  
MN I A66-34000
- RADIATION FROM HIGH-ENERGY-LEVEL TRANSITIONS  
EXCITED IN HE- NE LASER DURING OPTICAL PUMPING  
WITH HE LAMP A66-34697
- ATOMIC COLLISIONS, EXCITATION TRANSFER PROCESSES  
AND ENERGY LEVEL TRANSITION PROBABILITIES IN  
PLASMA OF GAS LASERS A66-39305
- GAS LASER FREQUENCY AND EMITTED POWER DEPENDENCE  
ON RESONATOR TUNING A66-39308
- EXPERIMENTAL EXCITED STATE BAND LOCATIONS AND  
INTENSITIES IN ABSORPTION SPECTRUM OF ELECTRON  
TRANSITIONS IN OPTICALLY PUMPED RUBY LASER  
A66-39569
- THEORETICAL EXCITED STATE ABSORPTION SPECTRUM OF  
ELECTRON TRANSITIONS IN OPTICALLY PUMPED RUBY  
LASER A66-39570
- COMPETITION OF TRANSITIONS AND EMISSION IN HE- NE  
LASER, USING RESONATOR WITHOUT DISPERSING PRISM  
A66-42127
- SPECTROSCOPY OF IR EMISSION AND LASER OSCILLATION  
RESULTING FROM TRANSIENT POPULATION INVERSIONS ON  
ELECTRONIC TRANSITIONS IN MOLECULAR NITROGEN  
A66-42550
- HYDROGEN MASER BEHAVIOR UNDER COHERENT LOW  
FREQUENCY ZEEMAN TRANSITION EXCITATION  
ECOM-2706 N66-38236
- THREE NEW VISIBLE CW LASER LINES IN DISCHARGE IN  
SINGLY-IONIZED CL A67-10373
- RADIATION FROM HIGH ENERGY LEVEL TRANSITIONS  
EXCITED IN HE- NE LASER DURING OPTICAL PUMPING  
WITH HE LAMP A67-10513
- RADIATIVE TRANSITION PROBABILITIES BETWEEN LASER  
VIBRATIONAL LEVELS OF CARBON DIOXIDE, NOTING  
RELAXATION TIME AND DIPOLE MOMENT A67-11891

- ISOTOPE SUBSTITUTION EFFECT ON NATURAL FREQUENCIES OF VIBRATIONAL-ROTATIONAL TRANSITIONS IN DIATOMIC AND TRIATOMIC MOLECULES AND GENERATION OF NEW IR MASER FREQUENCIES A67-16634
- ELECTRONIC EQUIPMENT**  
SUBMILLIMETER WAVELENGTH ELECTRONIC DEVICES, EXAMINING DEVELOPMENT OF LASERS AND REFLECTED WAVE TUBES WITH OVERLAPPING EFFECTIVE WAVE RANGE A66-38004
- R CA DEFENSE ELECTRONIC PRODUCTS APPLIED RESEARCH A67-11785
- SUBMILLIMETER WAVELENGTH ELECTRONIC DEVICES, EXAMINING DEVELOPMENT OF LASERS AND REFLECTED WAVE TUBES WITH OVERLAPPING EFFECTIVE WAVE RANGE A67-17168
- ELECTRONIC LEVEL**  
NEON LEVEL BROADENING UNDER EFFECT OF LASER RADIATION STUDIED BY OBSERVING HANLE EFFECT ON FLUORESCENT LIGHT A66-29640
- ELECTRONIC PACKAGING**  
LASER WELDING FOR ADVANCED ELECTRONIC PACKAGING A66-31593
- ELECTRONIC SWITCH**  
PULSE-CURRENT DELAY TIME EFFECT ON LASER TRIGGERED HIGH VOLTAGE SPHERE-SPHERE GAP AFWL-TR-65-32 N66-25900
- ELECTRONIC TRANSDUCER**  
CURRENT TRANSDUCER FOR MEASURING CURRENT PULSES IN KILOAMPERE RANGE AND SUITABLE FOR LASER RESEARCH APPLICATIONS A66-42820
- ELECTRONICS**  
ABSTRACTS OF 15 ARTICLES ON ELECTRONICS, MASERS, SEMICONDUCTOR DEVICES, AND RADIO AND OTHER TRANSMISSION SYSTEMS TAKEN FROM CHINESE PEOPLES REPUBLIC OPEN LITERATURE ATO 66-6 N66-28300
- SOVIET PAPERS ON QUANTUM ELECTRONICS A67-13124
- ELECTROSTATIC GYROSCOPE**  
INERTIAL SENSORS, DISCUSSING MAGNETIC RESONANCE AND SUPERCONDUCTOR GYROSCOPES, RING LASERS, FLUID DYNAMICAL DEVICES, ELECTROSTATIC GYROSCOPES, ETC A67-16517
- ELECTROSTATIC INSTRUMENT**  
ELECTROSTATIC PROBE MEASUREMENTS OF VELOCITY DISPLACEMENT AND ELECTRON DENSITY OF PLASMA USING LASER COMPARED WITH MEASUREMENTS USING MICROWAVE INTERFEROMETER A66-28269
- ELECTROSTATICS**  
STATIC CHARACTERISTICS OF GAS LASER INTERNAL MODULATION CIRCUIT, USING ELECTRO-OPTICAL CRYSTAL INSERTED INTO GAS LASER RESONATOR A66-32225
- ELLIPTICAL CYLINDER**  
ELLIPTIC CAVITY DESIGN FOR SOLID STATE LASERS, DISCUSSING MULTIPLE REFLECTIONS, ABSORPTION COEFFICIENT, REFRACTION LOSSES, ETC A66-25998
- OPTIMAL DESIGN OF ELLIPTICAL PUMPING CHAMBERS FROM NUMERICAL CALCULATIONS CONTAINING ALL GEOMETRIC SIZES OF PUMPING LAMPS AND LASER RODS AND REFLECTIVITY OF WALLS A67-19490
- EMISSION SPECTRUM**  
GALLIUM ARSENIDE P-N JUNCTION LASER DIODE, INJECTION CURRENT DISTRIBUTION, DENSITY AND EMISSION SPECTRA VARIATION A66-25934
- OPTICAL EMISSION FROM RUBY INDUCED BY SHORT PULSES OF RELATIVISTIC ELECTRONS IN WHICH ELECTRON-HOLE RECOMBINATION PRODUCES EXCITATION OF EMISSION A66-26173
- HIGH RESOLUTION PIEZOELECTRICALLY SCANNED FABRY-PEROT INTERFEROMETER USED TO STUDY GAIN PROFILES, MODE STRUCTURES AND EMISSION LINE WIDTHS OF CW AR, KR AND XE ION LASERS AND HG- HE PULSED LASER A66-26208
- L F FLUCTUATIONS IN EMISSION OF HE- NE GAS LASER MEASURED, USING FABRY-PEROT RESONATOR AND RING-TYPE RESONATOR A66-27186
- HELIUM-NEON LASER AFTERGLOW AND METASTABLE HELIUM ATOMS UNDER LONG PULSE EXCITATION A66-27335
- AXIAL AND TRANSVERSE MODE SELECTION, EMISSION SPECTRUM AND TRANSIENT EMISSION BEHAVIOR OF CONFOCAL RUBY LASER OPERATED IN ELLIPSOIDAL PUMPING SYSTEM A66-27606
- EMISSION SPECTRUM OF RUBY MASER CALCULATED, USING DYNAMICS OF TWO-LEVEL SYSTEMS A66-29988
- EFFECT OF ANOMALOUS DISPERSION ON STIMULATED EMISSION SPECTRUM OF DOPED CADMIUM FLUORIDE CRYSTALS A66-32317
- COHERENT AND SPONTANEOUS EMISSION FROM LEAD-TIN TELLURIDE ALLOYS UPON EXCITATION BY GA AS DIODE LASER, NOTING BAND STRUCTURE OF ALLOY SYSTEM A66-34159
- ORIENTATION EFFECT IN GA AS INJECTION LASERS, NOTING EMISSION CHARACTERISTICS AND STRUCTURAL SPECTRA A66-35404
- GALLIUM ARSENIDE LASERS OPERATING AT ROOM TEMPERATURE INVESTIGATED, BASED ON DIFFUSION P-N JUNCTIONS, DISCUSSING EMISSION SPECTRUM A66-36070
- PULSED LASER ACTION IN VISIBLE SPECTRUM OF SINGLY IONIZED GE, SN, PB, IN, CD AND ZN, LISTING TEMPERATURE AND PRESSURE RANGES A66-36076
- STIMULATED EMISSION SPECTRUM IN AXIAL-MODE MODEL OF PLANE RESONATOR IN STATIONARY GENERATION REGIME A66-38127
- ROOM TEMPERATURE PERFORMANCE OF GA AS LASER DIODES, USING S C RS TO ACHIEVE HIGH PULSE REPETITION RATE A66-40175
- COHERENT RADIATION GENERATION IN ELECTRON-HOLE INDIUM ANTIMONIDE PLASMA, DISCUSSING EMISSION SPECTRUM A66-40319
- FREQUENCY TUNING OF COHERENT EMISSION OVER VIBRONIC CONTINUUM OF PHONON-TERMINATED OPTICAL MASERS BY THERMAL TUNING AND WAVELENGTH-SELECTIVE FEEDBACK A66-41369
- L F FLUCTUATIONS IN EMISSION OF HE- NE GAS LASER MEASURED, USING FABRY-PEROT RESONATOR AND RING-TYPE RESONATOR A66-43084
- LASER MICROPROBE AS EXCITATION SOURCE FOR EMISSION SPECTROCHEMICAL ANALYSIS A66-43084
- SPONTANEOUS EMISSION SPECTRA AND RATIO OF NUMBER OF PHOTONS IN VARIOUS OSCILLATION MODES OF LASER WITH NONLINEAR FILTER TYPE LOCK A67-11573
- TUNABLE DISPERSION RESONATOR AND BROADENING OF LASER EMISSION SPECTRAL RANGE TO OBTAIN OPERATING FREQUENCY OTHER THAN FUNDAMENTAL A67-13131
- STEADY STATE LASER RADIATION DURING RELAXATION, DISCUSSING TIME-DEPENDENT SPECTRAL COMPOSITION, OSCILLATION MODES AND POLARIZATION CHARACTERISTICS A67-13134
- C W ARGON ION LASER SCATTERING IN ARGON PLASMA, NOTING RESONANCE AND CORRELATION BETWEEN DATA AND PLASMA PROPERTIES A67-16665
- STIMULATED EMISSION IN TRIPLET SYSTEM OF NITROGEN MOLECULE PRODUCED BY PULSED LASER DISCHARGE,

- IDENTIFYING LINES AND INTERPRETING INTENSITY DISTRIBUTION IN ROTATIONAL BAND SPECTRUM A67-16785
- SPECTROCHEMICAL ANALYSIS OF SOLID SPECIMEN FROM VAPOR FORMED BY LASER BEAM AND EXCITED BY SPARK DISCHARGE A67-16786
- LUMINESCENCE SPECTRUM OF CU CL AT LOW TEMPERATURES EXCITED BY DOUBLE PHOTON ABSORPTION FROM HIGH INTENSITY LASER BEAM A67-17822
- PARTICLE NUMBER FLUCTUATION IN SINGLE CELL OF KASTLER PHOTON SET, DISCUSSING STATISTICAL PROPERTIES OF LASER EMISSION IN MULTIMODE EXCITATION REGIME A67-19599
- SPECTRAL ANALYSIS OF EMISSION OF SPATIALLY SEPARATED SPOTS IN GA AS INJECTION LASERS A67-20185
- ENERGY**
- LASER PULSE ENERGY MEASUREMENTS WITH LIQUID ABSORPTION CELL CALORIMETER A67-15456
- ENERGY ABSORPTION**
- TRANSMISSION OF LUMINOUS FLUX DUE TO IONIZATION OF GASES BY HIGH POWER LASER, MEASURING ENERGY ABSORPTION IN IONIZED ZONE A66-36255
- THERMOELASTIC WAVE EQUATIONS IN CONTINUUM MECHANICS MODEL OF LASER-INDUCED FRACTURE IN TRANSPARENT MEDIA IN TERMS OF LASER BEAM ENERGY ABSORPTION A66-40089
- HIGH TEMPERATURE PLASMAS PRODUCED BY LASER HEATING TID-22132 N66-25340
- SELF-FOCUSING OF LASER BEAM IN PLASMA, SOLVING WAVE EQUATION FOR SLAB AND CYLINDRICAL BEAM CONFIGURATIONS A67-12089
- ENERGY BAND**
- CHANGE IN BASIC BARRIER RELATION FOR HETEROJUNCTION COMPARED TO HOMOJUNCTION OF WIDE GAP EMITTER INJECTION LASER A67-17097
- ENERGY CONVERSION**
- COUPLING BETWEEN OPPOSITELY DIRECTED TRAVELING WAVES IN HE-NE RING LASER IN FORM OF MUTUAL BACKSCATTERING OF ENERGY FROM EACH BEAM INTO DIRECTION OF OTHER A66-37778
- PULSED-MODE GAIN CHARACTERISTICS IN NEODYMIUM-DOPED SILICATE GLASS LASER EXPERIMENTALLY RELATED TO GIANT-PULSE LASER ENERGY OUTPUT A66-38396
- DEVELOPMENT OF OPTICAL QUANTUM GENERATOR FROM HIGHLY IONIZED LOW TEMPERATURE TO CONVERT HEAT ENERGY INTO ELECTRIC AND COHERENT LIGHT RADIATION ENERGIES FOR USE IN LASER JPRS-39659 N67-18113
- ENERGY DENSITY**
- LASER DAMAGE OF THIN FILMS - ENERGY DENSITY THRESHOLDS DETERMINED FOR SINGLE QUARTERWAVE AND HALF-WAVE FILMS VACUUM EVAPORATED ON GLASS AND QUARTZ SUBSTRATES AD-63354 N66-34015
- ENERGY DISSIPATION**
- STIMULATED EMISSION BY ELECTRON BEAM BOMBARDMENT OF LASER MATERIALS A67-14394
- ENERGY DISTRIBUTION**
- DISCREPANCY BETWEEN CALCULATED AND EXPERIMENTAL VALUES FOR RAMAN GAIN IN PULSED LASER SUGGESTS HIGHER ENERGY DISTRIBUTION DUE TO LIGHT TRAPPING OR BRILLOUIN SCATTERING A66-26157
- SELF-PUMPING CHEMICAL LASER THEORY AND OPERATION, NOTING CHEMICAL PUMPING A66-26382
- HEATING PROCESS IN LASER WELDING OF METAL SHEETS, TAKING INTO ACCOUNT ENERGY DISTRIBUTION, HEAT TRANSFER AND FLUX DENSITIES A66-29989
- PUMPING ENERGY DISTRIBUTION OF RUBY LASER, DISCUSSING EXISTENCE OF TRAPPED MODES AND EFFECT OF PARTIALLY FILLED WATER JACKET SURROUNDING RUBY RODS A66-35389
- PHOTOGRAPHIC MEASUREMENT OF ENERGY DISTRIBUTION IN BEAM OF Q-SWITCHED RUBY LASER NASA-CR-75102 N66-26252
- ENERGY LEVEL**
- LUNAR FIGURE AND ORBIT PARAMETERS MEASURED BY OPTICAL LOCATION METHOD A66-35285
- GAS LASER WITH GENERALIZED POLARIZATION CHARACTERISTICS, NOTING ROLE OF DEGENERATE ATOMIC ENERGY LEVELS A66-36005
- EIGENVALUES AND EIGENFUNCTIONS OF SPIN HAMILTONIAN AND MATRIX ELEMENTS OF SPIN OPERATOR OF RUBY A66-37584
- PHOTODISSOCIATION LASER SYSTEM, DISCUSSING OUTPUT ENERGY DEPENDENCE ON PRESSURE, TEMPERATURE AND NUMBER OF SUCCESSIVE OPTICAL PUMPING FLASHES A66-37781
- LASER CHARACTERISTICS OF NARROW BAND TYPE I SOLAR RADIO BURST AND MAGNETIC DIPOLE TRANSITIONS IN SPLIT ZEEMAN SUBLEVELS OF HYDROGEN ATOMS OF SOLAR CORONA IN GROUND LEVEL A67-11652
- PULSED GAS DISCHARGE LASERS NOTING REQUIRED ENERGY LEVEL FOR MAXIMUM EFFICIENCY, EXPERIMENTAL TECHNIQUES AND RESULTS A67-16650
- LOSS MEASUREMENT FOR RUBY LASER RESONANT CAVITY, COMPARING THRESHOLDS FOR R SUB 1 AND R SUB 2 LINE OPERATION A67-16655
- OPTICALLY PUMPED RUBY NOTING ABSORPTION AND EMISSION SPECTRUM, TRANSITION STAGES AND PHONON TERMINATED AMPLIFICATION A67-16658
- OSCILLATION IN CD S CRYSTAL BY RUBY LASER INDUCED TWO-PHOTON EXCITATION, NOTING PROPORTIONALITY OF ABSORPTION COEFFICIENT TO LIGHT BEAM INTENSITY A67-16667
- SEMICONDUCTOR LASERS NOTING STRONG FIELD BEHAVIOR AND ABSORPTION COEFFICIENT FOR SATURATION A67-16672
- ELECTROLUMINESCENCE, DISCUSSING SEMICONDUCTOR LASERS WITH VARIOUS EXCITATION SOURCES, LUMINESCENT EFFICIENCY, ETC A67-17889
- ENERGY LEVELS OF SIMPLE MOLECULAR GASES FOR POSSIBLE MOLECULAR LASER MATERIAL NASA-CR-80832 N67-14212
- ENERGY LOSS**
- LASER OSCILLATION AND ENERGY LOSSES IN MEDIUM CONTAINING ACTIVE MOLECULES A66-26043
- OPTICAL FREQUENCY BREAKDOWN THRESHOLD OF INERT GAS MIXTURES, USING FOCUSED BEAM RADIATION FROM Q-SPOILED NEODYMIUM LASER A66-34236
- MULTIMODE OSCILLATIONS OF SOLID STATE LASER UNDER STATIONARY CONDITIONS EXTENDED TO TREAT CAVITIES WITH LOSSY END MIRRORS OR WITH FREQUENCY DEPENDENT LOSSES AFCL-66-384 N66-33524
- EMISSION LOSSES IN SOLID STATE LASER RESONATOR CALCULATED FOR ND GLASS LASER A67-13133
- ENERGY-LOSING BLEACHING MECHANISM OF ORGANIC PHOTOTROPIC CRYSTALS USED FOR RUBY LASER SWITCHES ATD-66-119 N67-10437
- PROBABILITY METHOD OF DETERMINING ENERGY LOSSES IN RUBY LASER WITH MISALIGNED RESONATORS FTD-HT-66-492 N67-19235
- ENERGY SOURCE**
- BIPOLAR NI-CD CELLS FOR RUBY LASERS AND POWER SOURCES TO YIELD HIGH ENERGY PULSES FOR FIRING PYROTECHNIC DEVICES A66-41760



## ENERGY SPECTRUM

ENERGY SPECTRA OF IONS EMITTED BY BERYLLIUM,  
CARBON AND MOLYBDENUM HEATED BY LASER A66-25479

C W IR LASER OSCILLATION IN ATOMIC CL IN H CL  
AND HI GAS DISCHARGES, NOTING USE OF TWO POWER  
SUPPLIES AND ENERGY LEVEL DIAGRAM A66-28880

RADIATION NOISE EFFECT ON LASER OPTICAL  
PROPERTIES, NOTING DENSITY VS RESONATOR  
CHARACTERISTICS, ENERGY SPECTRUM, ETC A66-40917

## ENERGY STORAGE

RUBY LASER AMPLIFIER DYNAMICS, NOTING AMPLIFICATION  
IN ENERGY GAIN REGIMES AND CORRELATION TO  
THEORETICAL EQUATIONS A66-25049

SINGLE PULSE OPERATION OF LASERS, NOTING ENERGY  
STORAGE AND AMPLIFICATION EFFECT FOR FOUR- AND  
THREE-LEVEL ACTIVE MEDIUM A66-39711

## ENERGY TRANSFER

EXCITATION RADIATION TRANSFER FROM TRIVALENT  
CHROMIUM TO NEODYMIUM EXAMINED VIA FLUORESCENCE  
SPECTROSCOPY, NOTING ENERGY TRANSFER PARAMETERS  
AND EFFECT ON LASER OUTPUT A66-26175

LASER ACTION ON VIBRATIONAL-ROTATIONAL TRANSITIONS  
AND VIBRATION ENERGY TRANSFER A66-26204

ENERGY-RICH PLASMAS PRODUCED BY LIGHT PULSES FROM  
Q-SWITCHED LASER, NOTING ENERGY TRANSFER FROM  
ELECTRONS TO IONS DURING EXPANSION PROCESS A66-27607

COHERENT EMISSION FROM TRIVALENT HOLMIUM IONS IN  
RARE EARTH SUBSTITUTED YTTRIUM ALUMINUM GARNET,  
NOTING THREE ENERGY TRANSFER COMBINATIONS IN YAG  
A66-28690

LASER LINES DUE TO ENERGY TRANSFER FROM COLOR  
CENTERS TO ERBIUM IONS IN CALCIUM FLUORIDE  
CRYSTALS IRRADIATED BY GAMMA RAY A66-30278

ATOMIC COLLISIONS, EXCITATION TRANSFER PROCESSES  
AND ENERGY LEVEL TRANSITION PROBABILITIES IN  
PLASMA OF GAS LASERS A66-39305

C W LASER ACTION IN HOLMIUM-DOPED ERBIUM TRIOXIDE  
WITH DOMINANT PUMPING BY ENERGY TRANSFER BETWEEN  
IONS A66-42555

GLASS LASERS, COMPARING GLASS WITH CRYSTALS AS  
HOSTS FOR LASER IONS, CONSIDERING NEODYMIUM LASER  
PROPERTIES A66-42800

ULTRAVIOLET RADIATION FOR RUBY LASER PUMPING, AND  
ENERGY TRANSFER PROCESSES BETWEEN ELECTRON  
ORBITS AND BETWEEN UNLIKE IONS  
ML-1393 N66-24104

LASER EMISSION AT 1.06 MICRONS FROM YTTERBIUM-  
NEODYMIUM GLASS, NOTING LINEARITY OF ENERGY  
TRANSFER WITH YB CONCENTRATION A67-16664

HIGH POWER LASER RESEARCH - LASER MATERIAL  
EVALUATION, STIMULATED OUTPUT AND Q-SWITCHING,  
SELF-FOCUSING IN LIQUIDS, AND FLASH LAMP  
SPECTROSCOPY  
NRL-6444 N67-12645

ENERGY TRANSFER IN ACTIVATED GLASSES AND HIGH  
POWER LASER EMISSION N67-12646

SYNTHESIS OF MODEL COMPOUNDS AND INTRAMOLECULAR  
ENERGY TRANSFER FOR ORGANIC LASER MATERIALS, AND  
SENSITIVE RARE EARTH FLUORESCENCE IN ORGANIC  
SOLVENTS  
NASA-CR-81780 N67-18123

## EPITAXIAL DEPOSITION

MEASUREMENTS ON PHYSICAL AND LASER PROPERTIES OF  
VAPOR-GROWN RUBY SINGLE CRYSTALS PREPARED BY  
EPITAXIAL GROWTH A66-36081

1.60 MICRON STIMULATED AND SPONTANEOUS EMISSIONS  
FROM EPITAXIAL SINGLE CRYSTALS IN QUASI-BINARY  
III-V COMPOUND SEMICONDUCTOR DIODES OF INJECTION  
LASERS AT 77 DEGREES K A66-39750

SIMULTANEOUS DERIVATION OF OPTICAL GAIN FACTOR AND  
LOSS PER UNIT LENGTH OF SERIES OF SOLUTION GROWN  
DIFFUSED GA AS INJECTION LASER A67-11072

INDIUM ARSENIDE DIODE LASER FABRICATION USING  
LIQUID PHASE EPITAXY, NOTING QUANTUM EFFICIENCY  
A67-17096

## ERBIUM

LASER LINES DUE TO ENERGY TRANSFER FROM COLOR  
CENTERS TO ERBIUM IONS IN CALCIUM FLUORIDE  
CRYSTALS IRRADIATED BY GAMMA RAY A66-30278

## ERBIUM COMPOUND

C W LASER ACTION IN HOLMIUM-DOPED ERBIUM TRIOXIDE  
WITH DOMINANT PUMPING BY ENERGY TRANSFER BETWEEN  
IONS A66-42555

## ERROR SIGNAL

FREQUENCY STABILIZATION OF GAS LASER TO LOCK  
OUTPUT TO CENTER OF ATOMIC RESONANCE, USING ERROR  
SIGNAL A66-38241

## ETCHING

DISLOCATIONS AND PRECIPITATES IN GA AS INJECTION  
LASERS REVEALED BY NEW A-B ETCHANT A66-31071

ETCHING METHODS TO VISUALIZE LATTICE DISLOCATIONS  
AND GRAIN BOUNDARIES IN CZOCHRALSKI GROWN CALCIUM  
TUNGSTATE CRYSTALS DOPED WITH NEODYMIUM FOR LASER  
APPLICATION A67-19565

## EUROPIUM

DEUTERIUM ISOTOPE EFFECT ON THRESHOLDS OF EUROPIUM  
CHELATE LASERS, NOTING SOLVENT THERMAL EFFECTS  
A66-26598

FLUORESCENCE QUANTUM EFFICIENCIES OF OCTA-  
COORDINATED EUROPIUM HOMOGENEOUS AND MIXED  
CHELATES IN ORGANIC SOLVENTS, NOTING EFFECT OF  
OXYGEN REMOVAL A66-41153

SPECTROSCOPIC, CHEMICAL AND LASER PROPERTIES OF  
PIPERIDINIUM SALT OF EUROPIUM TETRAKIS A66-43034

DIRECT-EXCITATION LIQUID LASER MEASURED FOR  
QUANTUM EFFICIENCY FLUORESCENCE  
AD-628526 N66-24728

## EUROPIUM COMPOUND

PHYSICAL PROPERTIES AND OPERATING CHARACTERISTICS  
OF EUROPIUM AND RARE EARTH CHELATE LASERS  
TR-66-052.13 N67-12533

## EVAPORATION

HEATING AND SCATTERING OF PLASMA PRODUCED BY  
GIANT LASER PULSE FOCUSED ON SOLID TARGET A67-14194

GAS DYNAMIC EQUATIONS FOR DETERMINATION OF  
HEATING, VAPORIZATION AND EXPANSION OF SUBSTANCE  
DUE TO Q-SWITCHED LASER RADIATED COLLIMATES ONTO  
SURFACE OF SOLIDS A67-16652

## EXCITATION

LASER MICROPROBE AS EXCITATION SOURCE FOR EMISSION  
SPECTROCHEMICAL ANALYSIS  
AFCRL-65-855/1/ N66-29249

HYDROGEN MASER BEHAVIOR UNDER COHERENT LOW  
FREQUENCY ZEEMAN TRANSITION EXCITATION  
ECOM-2706 N66-38236

EXCITATION AND RELAXATION MECHANISMS FOR CLOSED  
MOLECULAR GAS LASER A67-16631

## EXCITED STATE

ABSORPTION BEHAVIOR OF OPTICALLY PUMPED RUBY ROD,  
NOTING AMPLIFICATION AT ROOM TEMPERATURE AND  
ABSORPTION AT CRYOGENIC TEMPERATURE

- A66-26174  
STEADY STATE VARIATION OF LIGHT INTENSITY WITH DISTANCE FOR MONOCHROMATIC LIGHT, NOTING DEPENDENCE OF ABSORPTION COEFFICIENT ON DEGREE OF EXCITATION OF ELECTRONIC SYSTEM
- A66-26183  
HELIUM-NEON GAS LASER USED TO STUDY PRESSURE EFFECT ON LINE SHAPE OF 2S-2P OPTICAL TRANSITIONS OF NEON EXCITED STATES
- A66-26198  
EFFECTIVE LIFETIME OF EXCITED STATE OF GAS LASER, WITH ACCOUNT OF NEAR PHOTON TRANSFER
- A66-27135  
RADIATIVE CASCADE PATTERNS IN HELIUM-NEON GAS SYSTEM USING IDEALIZED MODEL, COMPUTING SPONTANEOUS DECAYS WHICH ARE COMPARED WITH LASER EXPERIMENTS
- A66-28699  
ATOMIC COLLISIONS, EXCITATION TRANSFER PROCESSES AND ENERGY LEVEL TRANSITION PROBABILITIES IN PLASMA OF GAS LASERS
- A66-39305  
EXPERIMENTAL EXCITED STATE BAND LOCATIONS AND INTENSITIES IN ABSORPTION SPECTRUM OF ELECTRON TRANSITIONS IN OPTICALLY PUMPED RUBY LASER
- A66-39569  
THEORETICAL EXCITED STATE ABSORPTION SPECTRUM OF ELECTRON TRANSITIONS IN OPTICALLY PUMPED RUBY LASER
- A66-39570  
SPECTROSCOPIC AND MICROWAVE INVESTIGATION OF LASERING PLASMAS, ELECTRON GAS, AND EXCITED STATE POPULATIONS OF ACTIVE MEDIUM
- A66-66-89  
MEASUREMENT OF EXCITED STATE ABSORPTION CROSS SECTION IN RUBY AT RUBY LASER WAVELENGTH
- A66-34481  
TUNABLE LASER BEAM FOR INVESTIGATING HIGHLY EXCITED STATES OF ATOMS IN DISCHARGE
- A66-36881  
STEADY STATE REGIME AND STABILITY OF TWO-PHOTON LASER, NOTING FIELD DEPENDENCE OF INTENSITY AND DURATION OF FREQUENCY PULSE AND RESONANCE EXCITATION CURVES
- A67-14745  
GAS LASER SPECTROSCOPIC ANALYSIS OF HYPERFINE STRUCTURE, PARAMAGNETIC PROPERTIES, RADIATIVE LIFETIMES AND DOPPLER-BROADENED TRANSITION SATURATION BEHAVIOR OF EXCITED STATES OF Xe 129
- A67-15462  
NATURE OF EXCITED STATE RESULTING FROM TWO-QUANTUM ABSORPTION ASSOCIATED WITH FLUORESCENCE IN ANTHRACENE PRODUCED BY RUBY LASER
- A67-16130  
GAS LASER PUMPED MICROWAVE EMISSION FOR PRODUCING CONTROLLED EXCITED STATE POPULATION FOR RF SPECTROSCOPY OF NEON
- A67-16638  
DOUBLE RESONANCE EFFECTS EXTENDED TO CASE OF STIMULATED EMISSION IN EXCITED STATES OF NEON, USING GAS LASER IN TRANSVERSE DC MAGNETIC FIELD
- A67-16645  
THERMALLY EXCITED INFRARED BEAM LASER USING CARBON DIOXIDE, NITROGEN OXIDE, AND HYDROCYANIC ACID MOLECULAR ENERGY LEVELS
- A67-15769  
**EXPANSION WAVE**  
COMPETITION OF TWO TYPES OF OSCILLATIONS IN TRAVELING WAVE LASER
- A67-10362  
EXPANSION VELOCITY OF LUMINOUS FRONT OF PLASMA PLUME GENERATED BY GIANT PULSE LASER
- A67-13573  
COMPETITION OF TWO TYPES OF OSCILLATIONS IN TRAVELING WAVE LASER
- A67-17620  
**EXPLODING CONDUCTOR**  
LASER TECHNIQUE ACQUISITION OF DATA ON EXPLODING-WIRE PHENOMENA IN EXPLOSION MODEL, SUPERSONIC MODEL AND ABLATION MODEL
- A66-41701  
**EXPLORER XXII SATELLITE**  
RUBY LASER TO ILLUMINATE EXPLORER XXII SATELLITE WITH ENOUGH INTENSITY TO PHOTOGRAPH CUBE CORNER REFLECTORS LOCATED ON SATELLITE
- A66-65-442  
**EXPLORER SATELLITE**  
RUBY LASER ENERGY REFLECTED OFF EXPLORER XXII SATELLITE
- A66-27054  
LASER TECHNOLOGY AND APPLICATION ESPECIALLY IN OPTICAL RADAR AND SPACE TRACKING ON EXPLORER SATELLITES
- A66-31850  
NASA FACTS, VOL. III, NO. 6  
LASER REFLECTIONS FROM BEACON EXPLORER SATELLITE
- A67-18446  
NASA-TM-X-57166  
**EXPLOSIVE GAS**  
TRANSITION TO DETONATION IN GASEOUS MEDIUM EXPERIMENTALLY STUDIED, BASED ON SELF-SUSTAINED DETONATION FRONT AND ADAPTATION OF AMPLITUDE MODULATED GIANT PULSE LASER SYSTEM
- A67-13500  
**EXTENSOMETER**  
EXTENSOMETER FOR MEASURING SMALL CHANGES OF SPECIMEN ON TENSILE TESTING VACUUM FURNACE AT HIGH TEMPERATURES, USING CW GAS LASER AS LIGHT SOURCE
- A67-11036  
LASER EXTENSOMETER MEASURING SMALL DIMENSIONAL CHANGES OF SPECIMEN IN TENSILE TESTING FURNACE AT HIGH TEMPERATURES
- A67-18778  
**EXTRUSION**  
HOMOGENIZING METHODS FOR PLATINUM-FREE LASER GLASS, AND MELTING OF HIGH-PURITY LASER GLASS IN ALL-CERAMIC SYSTEM
- A66-30525  
**EYE**  
RUBY LASER INJURY TO EYE OF MONKEYS, MACACA CYNOMOLGUS AND CERCOPITHECUS TORQUATUS ATYS
- A67-80364  
EFFECTS OF RUBY LASER RADIATION ON OCULAR TISSUE OF RABBITS AND ESTIMATION OF HUMAN CORNEAL THRESHOLD
- A67-10968  
FA-R-1815  
**EYE PROTECTION**  
PROTECTION AND HAZARD TO EYES OF UNINFORMED OPERATORS AND BYSTANDERS FROM LASER LIGHT
- A66-27668  
LASER RADIATION EFFECT ON EYE - RETINAL BURNS, IMAGERY, AND SAFETY PRESCRIPTION
- A66-39840  
TOCK-46027  
SAFETY PROGRAM FOR LASER HAZARDS, DISCUSSING EYE AND BODY PROTECTION
- A67-19089  
**F**  
**FABRY-PEROT INTERFEROMETER**  
HIGH RESOLUTION PIEZOELECTRICALLY SCANNED FABRY-PEROT INTERFEROMETER USED TO STUDY GAIN PROFILES, MODE STRUCTURES AND EMISSION LINE WIDTHS OF CW AR, KR AND Xe ION LASERS AND HG- HE PULSED LASER
- A66-26208  
RUBY LASER MONOCHROMATIC RADIATION SEPARATION BY TAPERED MULTIPLEX INTERFEROMETER WITH OPPOSITION DISPERSION
- A66-26471  
LASER OSCILLATION WITH TOTALLY REFLECTING ROOF PRISM AS CAVITY, NOTING OUTPUT VS MIRROR ALIGNMENT FOR TWO ROTATION AXES
- A66-29414  
PARTICLE VELOCITY IN GAS PARTICLE TWO-PHASE NOZZLE EXPANSION USING GAS LASER AND FABRY-PEROT INTERFEROMETER FOR ROCKET ENGINE PREPULSION

- AIAA PAPER 66-522 A66-31500
- FABRY- PEROT ETALON USE FOR INTERFEROMETRY AND LASER CONTROL, NOTING LOW ANGLE SCATTERING, LASER OSCILLATION, THERMAL TUNING SENSITIVITY, ETC A66-32619
- LASER EMISSION INTERFEROGRAMS OBTAINED WITH FABRY- PEROT CROSS-GRATING INTERFEROMETER IN SUBMILLIMETER WAVELENGTH RANGE A66-37546
- OPTICAL SPECTRA OF ULTRASHORT OPTICAL PULSES GENERATED BY MODE-LOCKED GLASS-DOPED NEODYMIUM LASERS, CONSIDERING SATURABLE ABSORBER CELL PLACED PARALLEL TO FABRY- PEROT REFLECTOR A66-39115
- LASER AMPLIFIER THEORY USING FABRY- PEROT INTERFEROMETER AND LAPLACE TRANSFORM FOR OBTAINING TRANSIENT SOLUTIONS IN ADDITION TO STEADY STATE SOLUTIONS A66-39224
- RUBY LASER GIANT PULSE OFF-AXIAL MODES DETECTED WITH HIGH RESOLUTION SPHERICAL FABRY- PEROT INTERFEROMETER A66-41627
- INTENSITY DEPENDENT FREQUENCY SHIFT IN SPECTRAL OUTPUT OF MONOCHROMATIC GIANT PULSE LASERS MEASURED, USING FABRY- PEROT INTERFEROMETER A67-10251
- FABRY-PEROT LASER**  
PRESSURE EFFECTS IN FABRY- PEROT LOSSY-CAVITY GAS LASER OUTPUT A66-26199
- MODE THEORY OF SPHERICAL MIRROR RESONATORS, DISCUSSING DIFFRACTION LOSSES, RESONANT CONDITIONS, MODE PATTERNS, INTERNAL FOCUSING ELEMENTS, MODE SELECTION, ETC A66-36972
- SPECTRAL AND TIME-DEPENDENT CHARACTERISTICS OF STIMULATED RADIATION FROM RUBY PULSE LASER, USING FABRY- PEROT ETALON IN FINE-STRUCTURE OBSERVATION A66-39823
- RECOMBINATION RADIATION FROM GA AS P-N JUNCTIONS WITH AND WITHOUT FABRY- PEROT RESONATOR, NOTING PARAMETER DEPENDENCE ON CURRENT DENSITY A66-40314
- THEORY OF STEADY MULTIMODE OSCILLATION OF SOLID STATE LASER EXTENDED TO CAVITIES WITH INEFFICIENT END MIRRORS OR LOSSES DEPENDENT ON FREQUENCY A66-41274
- SPECTRAL AND MODE PROPERTIES OF RUBY, SOLID STATE, FABRY- PEROT, AND NEODYMIUM-DOPED YAG LASERS S-852 N66-30264
- EXPERIMENT WITH MICROWAVE OPEN RESONATOR OF FABRY- PEROT TYPE AFCRL-66-496 N66-38268
- OPTICAL PUMPING WITH DIODE LASER INTO FABRY- PEROT RESONATOR FACE OF THIN HIGHLY-ABSORBING SEMICONDUCTOR, NOTING VARIABLE MODE SPACING INCLUDING SINGLE MODE OUTPUT A67-10879
- SINGLE MODE APPROXIMATION OF PARAMETRIC EXCITATION AND SELF-EXCITATION OF OSCILLATIONS IN FABRY- PEROT RESONATOR FILLED WITH NONLINEAR DISPERSIVE MEDIUM A67-11575
- I- V CHARACTERISTIC OF GA AS DIODE WITH FABRY- PEROT RESONATOR, NOTING VARIATIONS DURING AMPLIFICATION TO GENERATION TRANSITION A67-15132
- SEMICONDUCTOR LASERS WITH RADIATING MIRRORS DEVELOPED BY EXCITATION, USING ELECTRON BEAM AND NEODYMIUM LASER GLASS RADIATION A67-16669
- FIZEAU FRINGES PRODUCED IN LASER ILLUMINATED FABRY- PEROT INTERFEROMETER TO OBTAIN CONCENTRATION PROFILES IN TURBULENT AND LAMINAR JETS A67-17371
- ELECTRO-OPTIC INTRA-CAVITY COLOR SWITCHING IN KRYPTON ION FABRY- PEROT LASER A67-17888
- RECOMBINATION RADIATION OF P-N JUNCTIONS IN GA AS WITH AND WITHOUT FABRY- PEROT CAVITY, DISCUSSING NONEQUILIBRIUM CURRENT CARRIER KINETICS AND I-V CHARACTERISTICS A67-18934
- FAILURE MODE**  
CAUSES OF FAILURE AND GUIDELINES FOR DESIGN OF SOLID STATE LASERS A66-27669
- FAR FIELD**  
BEAM DIVERGENCE AND FAR FIELD PATTERNS IN RUBY LASERS A66-31098
- CONFOCAL RESONATOR THEORY INSTEAD OF DIFFRACTION AS EXPLANATION OF 90 DEGREE ROTATION BETWEEN NEAR AND FAR FIELDS OF RUBY LASERS A66-38243
- FAR FIELD PATTERN OF SHEET-LIKE LASER BEAM FROM ELECTRON BOMBARDED CD S AND ZN O SINGLE CRYSTALS A67-19798
- FAR INFRARED**  
MODES OF TILT-MIRROR OPTICAL RESONATOR, USING SPILLOVER RADIATION TO EXTRACT COHERENT FAR IR A66-31134
- MULTIPLE CYCLOTRON RESONANCE ABSORPTION LINES IN DEGENERATE VALENCE BANDS OF GE SEMICONDUCTOR STUDIED WITH FAR IR LASER SUBMILLIMETER SPECTROMETER A66-42545
- PARAMETRIC AMPLIFICATION OF FAR IR IN TE CRYSTAL PUMPED BY CARBON DIOXIDE LASER A67-13572
- TIME BEHAVIOR OF PULSED WATER VAPOR LASER, NOTING SPIKING FROM FAR IR EMISSION LINES A67-20095
- FAR ULTRAVIOLET**  
X UV C, TI, MN, FE, NI, CU, ZN AND AR LINE SPECTRA AND CONTINUUM RADIATION SPECTRA IN PLASMAS PRODUCED BY FOCUSED RUBY LASER BEAM A66-39812
- FARADAY EFFECT**  
MAGNETIZATION INDUCED BY CIRCULARLY POLARIZED LASER LIGHT INCIDENT ON NONABSORBING MATERIAL, IN ABSENCE OF EXTERNAL MAGNETIC FIELD, IN DOPED CALCIUM FLUORIDE PROPORTIONAL TO LIGHT INTENSITY AND VERDET CONSTANT A66-26142
- I R AND VISIBLE HELIUM-NEON LASER MODULATION USING FARADAY ROTATION IN YIG A66-26881
- FARADAY ROTATION OBTAINED WITH PULSED HIGH-FIELD MAGNETS FOR CONTROLLING LASER CAVITIES A66-35380
- OPERATION OF Q-SWITCHING DEVICE BASED ON FARADAY EFFECT AND USED WITH RUBY LASER FOR APPLICATION TO PLASMA DIAGNOSTICS A66-36079
- LONGITUDINAL MAGNETIC FIELD EFFECT UPON GAS DISCHARGE, ZEEMAN EFFECT AND FARADAY EFFECT IN HE- NE GAS LASER A66-40586
- SATURATION INDUCED OPTICAL NONRECIPROCITY IN HE- NE RING LASER PLASMA, ELIMINATING FREQUENCY LOCKING BY USING FARADAY EFFECT A66-42552
- CURRENT MEASURING DEVICE FOR EHV TRANSMISSION LINE, OBTAINING INSTANTANEOUS MAGNETIC FIELD BY GAUGING FARADAY ROTATION ANGLE OF LASER BEAM IN FLINT GLASS ROD A66-42556
- S HF MODULATION TECHNIQUES FOR LASER RADIATION, COVERING FARADAY, KERR AND PCKEL EFFECTS, CIRCULAR DICHROISM, ETC A67-13138
- INTRACAVITY TIME-VARYING PERTURBATION OF LOSSES IN GAS LASER USING DIAMAGNETIC FARADAY EFFECT IN GLASSES ANALYZED IN CONNECTION WITH OUTPUT INTENSITY A67-16646

- HIGH POWER LASER RESEARCH - LASER MATERIAL EVALUATION, STIMULATED OUTPUT AND Q-SWITCHING, SELF-FOCUSING IN LIQUIDS, AND FLASH LAMP SPECTROSCOPY  
NRL-6444 N67-12645
- FARADAY EFFECT AS SWITCHING TECHNIQUE FOR HIGH POWER LASER OUTPUT  
N67-12651
- FARADAY ROTATION**  
FARADAY ROTATORS FOR HIGH POWER LASER CAVITIES AND INTERACTION OF MACROSCOPIC PARTICLES WITH COHERENT LIGHT BEAMS  
AFOSR-66-1090 N66-36913
- FARADAY ROTATORS FOR HIGH POWER LASER CAVITIES  
N66-36914
- FARADAY ROTATION MEASUREMENT OF TRAPPED MAGNETIC FIELDS IN THETA PINCH PLASMA, USING GAS LASER BEAM  
A67-17447
- FAST ELECTRON**  
LASER BASED ON EXCITATION OF GALLIUM PHOSPHORUS ARSENIDE SOLID SOLUTION BY BEAM OF FAST ELECTRONS  
A66-33304
- LASER BASED ON EXCITATION OF GALLIUM PHOSPHORUS ARSENIDE SOLID SOLUTION BY BEAM OF FAST ELECTRONS  
A67-11824
- FEEDBACK**  
LASER ACTION WITH NONRESONANT FEEDBACK USING HIGH GAIN RUBY CRYSTALS  
A66-30297
- RUBY LASER WITH NONRESONANT FEEDBACK BY USING VOLUME OR SURFACE SCATTERER  
N66-28924
- RUBY LASER WITH SCATTERING INDUCED FEEDBACK AND ABSENCE OF RESONANCE TYPE OSCILLATIONS  
A67-10740
- RUBY LASER WITH NONRESONANT FEEDBACK DUE TO RADIATION SCATTERING, SHOWING USE AS OPTICAL FREQUENCY STANDARD  
A67-16642
- FEEDBACK AMPLIFIER**  
OSCILLATION CONDITIONS FOR FEEDBACK LASERS, SUPERRADIANT DIRECTIONALLY COHERENT EMISSION LASERS AND COHERENCE BRIGHTENED EMISSION LASERS  
A66-32628
- ELECTRON DENSITIES IN HELIUM PLASMA MEASURED BY LASER AMPLIFIER WITH MAXIMUM GAIN AND MINIMUM BANDWIDTH AT POINT NEAREST THRESHOLD  
A67-16663
- FEEDBACK CONTROL SYSTEM**  
LASER OUTPUT ENERGY CONTROLLER HAVING EIGHT-TO-ONE IMPROVEMENT IN PULSE REPEATABILITY IN SOLID STATE LASERS  
A66-36034
- Q-SWITCHED RUBY LASER CONFIGURATION WITH FEEDBACK CONTROL, NOTING FREQUENCY AND INSTABILITY CORRELATION WITH THEORETICAL RESULTS OBTAINED FROM MATHEMATICAL MODEL  
A67-16676
- SINGLE MODE 6328 ANGSTROM UNITS HE- NE LASER HAVING SINGLE FREQUENCY POWER OUTPUT OF 50 MWATT STABILIZED BY FEEDBACK SYSTEM WHOSE OUTPUT IS NEITHER AMPLITUDE NOR FREQUENCY MODULATED  
A67-16685
- FERMI STATISTICS**  
SHALLOW DONOR INTRODUCTION IN P-TYPE GA- AS LASER RESULTS IN INCREASED EFFICIENCY OF RADIATIVE RECOMBINATION  
A67-17280
- FERRIC ION**  
SOLID STATE MASER OSCILLATOR OPERATING IN ZERO FIELD CONFIGURATION, USING FERRIC ION SUBSTITUTED AS IMPURITY IN ALUMINUM NITRATE HOST CRYSTAL  
A66-42551
- FERROELECTRICS**  
FERROELECTRIC MATERIALS FOR LIGAND FIELD MASER IN MILLIMETER RANGE - LIGAND FIELD NEAR GROUND STATE CROSSEOVERS MEASURED BY OPTICAL AND MICROWAVE SPECTROSCOPY
- MC-64-102-R2 N66-39741
- FERROMAGNETIC FILM**  
MAGNETIC DOMAIN PATTERNS IN THIN FERROMAGNETIC FILMS USING 10 MILLIWATT HELIUM-NEON LASER  
N66-30158
- FIBER OPTICS**  
PASSIVE CORE FIBER LASER DOES NOT REMOVE COMPLETELY NEED FOR OPTICAL QUALITY IN CLADDING MATERIAL  
A67-16666
- FIELD MODE THEORY**  
GAS LASER WITH GENERALIZED POLARIZATION CHARACTERISTICS, NOTING ROLE OF DEGENERATE ATOMIC ENERGY LEVELS  
A66-36005
- FIELD THEORY**  
MODELS OF MATTER-ELECTROMAGNETIC FIELD INTERACTION FOR GAS LASERS, USING PERTURBATION THEORY  
A66-26216
- FIGURE OF MERIT**  
PHOTOMETRIC FIGURES OF MERIT FOR VARIOUS SHAPED SEMICONDUCTOR LUMINESCENT SOURCES OPERATING IN SPONTANEOUS MODE  
A66-27495
- L-BAND TRAVELING WAVE MASER USING CHROMIUM DOPED RUTILE, DISCUSSING INVERTED SUSCEPTIBILITY AS FIGURE OF MERIT  
A66-38239
- FILAMENT**  
NEW CLASS LIGHT FILAMENT IDENTIFIED IN RAMAN RADIATION OF INTENSE RUBY LASER BEAM  
NASA-TM-X-57831 N66-33863
- COUPLING MECHANISM IN PASSIVE Q-SWITCHING OPERATION BETWEEN FILAMENTS AT DIFFERENT REGIONS OF RUBY LASER ROD  
A67-10813
- FILTER**  
RUBY LASER WITH LIQUID FILTER, CONSIDERING RELATION BETWEEN FILTER EFFICIENCY AND ABSORPTION CURVE PARAMETERS WHEN ACTING AS Q-FACTOR MODULATOR  
A67-12423
- FLASH**  
TIME RESOLVED SPECTROSCOPY OF FLASHLAMP PULSES  
N67-12652
- FLASH TUBE**  
RUBY LASER PUMPING SYSTEM AND LOW COST MERCURY FLASH TUBE WITH HIGH REPETITION RATES USED FOR MICROMACHINING PROCESS  
A66-40336
- APPROXIMATE ABSOLUTE VALUES OF PUMPING POWER, THRESHOLD POWER AND CRITICAL EXCESS POPULATION FOR RUBY LASER DETERMINED FROM RELATIVE FLASH TUBE INTENSITY MEASUREMENTS  
A67-10245
- FLASHLIGHT /INCOHERENT/ PUMPING OF VISIBLE AND IR, IN SB AND CD S- CD SE LASERS  
A67-10447
- FLAW DETECTION**  
LASER MICROPROBE USED TO STUDY SMALL INCLUSIONS IN METALS  
A67-15461
- FLOW CHARACTERISTICS**  
HIGH TEMPERATURE FLOW CHARACTERISTICS IN FREE PISTON SHOCK TUBE MEASURED BY MEANS OF PULSED LIGHT OF HE- NE GAS LASER  
A66-35353
- FLOW EQUATION**  
ONE-DIMENSIONAL HEAT FLOW EQUATION FOR LIQUID NITROGEN END-COOLED RUBY LASER ROD  
A66-38386
- FLOW METER**  
LASER DOPPLER VELOCIMETER FOR MEASURING LOCALIZED FLOW VELOCITIES IN LIQUIDS  
A66-27053
- FLOW VELOCITY**  
LASER DOPPLER VELOCIMETER FOR MEASURING LOCALIZED FLOW VELOCITIES IN LIQUIDS  
A66-27053
- PLASMA FLOW VELOCITY PROFILE MEASUREMENT BY ELECTROSTATIC PROBE DETECTION OF PLASMA DROP CAUSED BY GAS BREAKDOWN DUE TO FOCUSED GIANT PULSE

- LASER A66-38395 A67-16677
- LASER DOPPLER VELOCIMETER FOR GAS AND LIQUID FLOW  
VELOCITY MEASUREMENT A66-42557
- DISCHARGE TUBE DIMENSIONS, FLOW RATE, WALL  
TEMPERATURE, AND GAS MIXTURES DEFINED FOR CARBON  
DIOXIDE GAS LASER N67-16633
- NASA-CR-81332
- FLOW VISUALIZATION
- COHERENT GAS LASER LIGHT TO MEET REQUIREMENTS OF  
STREAK PHOTOGRAPHY FOR TIME-RESOLVED FLOW  
VISUALIZATION A66-32959
- FLUID
- LINEAR INSTABILITY OF LASER PROPAGATION IN FLUID  
WITH COUPLING BETWEEN LIGHT AND MEDIUM A66-35034
- FLUID MECHANICS
- INTERFEROMETER DESIGN FOR USE WITH LASER LIGHT IN  
FLUID MECHANICS A67-15455
- FLUID ROTOR GYROSCOPE
- INERTIAL SENSORS, DISCUSSING MAGNETIC RESONANCE  
AND SUPERCONDUCTOR GYROSCOPES, RING LASERS, FLUID  
DYNAMICAL DEVICES, ELECTROSTATIC GYROSCOPES, ETC  
A67-16517
- FLUORESCENCE
- SPECTROSCOPY OF LITHIUM FLUORIDE CRYSTALS  
ACTIVATED WITH URANIUM TRIOXIDE FOR LASER ACTION,  
SHOWING ANOMALOUS FLUORESCENT DECAY UNDER HIGH  
INTENSITY PUMPING A66-25997
- FLUORESCENT LIFETIMES OF NEODYMIUM, YTTERBIUM AND  
SAMARIUM INCORPORATED IN ORDERED PEROVSKITE-TYPE  
COMPOUNDS DETERMINED, NOTING CRYSTAL STRUCTURE  
POTENTIAL FOR LASER EMISSION A66-27976
- FLUORESCENT-SOLID LASERS DESIGN AND PERFORMANCE  
NOTING MATERIALS A66-33250
- FLUORESCENCE OF RARE EARTH, ACTINIDE AND  
TRANSITION METAL IONS IN INSULATING CRYSTALS AS  
RESULT OF OPTICAL EXCITATION, DISCUSSING  
SPECTROSCOPIC PROPERTIES AND OPERATING  
CHARACTERISTICS A66-36969
- RUBY LASER RADIATION EFFECT ON FLUORESCENCE AND  
LASER ACTION IN DYSPROSIUM DOPED CALCIUM FLUORIDE  
CRYSTALS A66-37656
- OPTICAL PROPERTIES OF CRYPTOCYANINE NOTING  
TRANSIENT DECAY OF FLUORESCENCE, USING RUBY LASER  
AND TRANSMISSION OF METHANOL SOLUTION A66-40103
- FEASIBILITY OF USING FLUORESCING DYES PUMPED WITH  
RUBY LASER FOR LOWER THRESHOLDS THAN RAMAN TYPE  
LASERS N66-38187
- AD-636953
- TEMPERATURE DEPENDENCE OF THRESHOLD FOR STIMULATED  
EMISSION OF NO TRIVALENT ION IN SEVERAL HOST  
LATTICES ESTIMATED FROM INTENSITY VARIATION OF  
LASER ACTIVE FLUORESCENCE COMPONENT A67-11085
- FLUORESCENT EMISSION OF NEODYMIUM LASER TRIGGERED  
BY POKCKS EFFECT AS FUNCTION OF POPULATION  
INVERSION A67-13201
- POPULATION INVERSION VARIATION DURING LASER  
EMISSION AS SHOWN BY MEASUREMENTS OF FLUORESCENCE  
INTENSITY A67-15497
- NATURE OF EXCITED STATE RESULTING FROM TWO-QUANTUM  
ABSORPTION ASSOCIATED WITH FLUORESCENCE IN  
ANTHRACENE PRODUCED BY RUBY LASER A67-16130
- TERMINAL LEVEL LIFETIME AND FLUORESCENCE LINE OF  
NEODYMIUM DOPED GLASS INFLUENCE ON DYNAMICS AND  
EFFICIENCY OF Q-SPOILED LASER A67-16675
- SATURABLE OPTICAL ABSORPTION OF LIGHT FLUX FROM  
HIGH INTENSITY Q-SWITCHED RUBY LASER
- TEMPERATURE DEPENDENCE OF FLUORESCENT FREQUENCY  
SHIFT IN RUBY LASER  
FTD-TT-65-2006 N67-10978
- SYNTHESIS OF MODEL COMPOUNDS AND INTRAMOLECULAR  
ENERGY TRANSFER FOR ORGANIC LASER MATERIALS, AND  
SENSITIVE RARE EARTH FLUORESCENCE IN ORGANIC  
SOLVENTS N67-18123
- NASA-CR-81780
- FLUORESCENT EMISSION
- ORGANIC SENSITIZERS FOR EVALUATION OF TRANSITION  
METAL FLUORESCENCE IN OPTICAL LASER APPLICATION  
NASA-CR-77913 N66-36265
- FLUORIDE
- GROWTH OF SINGLE CRYSTALS OF RARE-EARTH FLUORIDES  
FOR LASER APPLICATION, USING HYDROGEN FLUORIDE  
ATMOSPHERE, NOTING ION EXCHANGE PURIFICATION  
A66-31082
- FLUORO COMPOUND
- GAS LASER OUTPUT AND THRESHOLD IN POPULATION  
INVERSION FROM PHOTODISSOCIATION OF METHYL IODIDE  
AND FLUORIODOD METHYLIDYNE A66-35368
- FLUX DENSITY
- HEATING PROCESS IN LASER WELDING OF METAL SHEETS,  
TAKING INTO ACCOUNT ENERGY DISTRIBUTION, HEAT  
TRANSFER AND FLUX DENSITIES A66-29989
- FOCUSING
- OPTICAL RAY TRACING TO PREDICT FOCUSING  
CHARACTERISTICS OF LASER LIGHT IN REFRACTIVE  
TARGETS, CALCULATING HEATING EFFECTS IN TARGET,  
NOTING TARGET GEOMETRY, REFRACTIVE INDEX,  
THICKNESS OF SKIN LAYERS, ETC A66-25531
- COHERENT LIGHT RECORDING/REPRODUCING TECHNIQUES  
BASED ON DEBYE THEORY OF COHERENT LIGHT SOURCE  
FOCUSING A66-25541
- OPTICAL NONLINEARITIES MEASURED BY GAUSSIAN LASER  
BEAM  
ML-1405 N66-39487
- SELF-FOCUSING OF RUBY LASER BEAM IN NA CL  
CRYSTALS A67-12481
- FOG
- READOUT TECHNIQUE FOR LASER FOG DISDROMETER  
A66-33346
- FOKKER-PLANCK EQUATION
- FOKKER- PLANCK EQUATION APPLIED TO LASER UNDER  
INFLUENCE OF QUANTUM FLUCTUATIONS CONNECTED WITH  
DISSIPATION, PUMPING AND CAVITY THERMAL NOISE,  
NOTING DISTRIBUTION AND CORRELATION FUNCTION  
A66-38930
- FORCED OSCILLATION
- TRAVELING WAVES INTERACTION IN GAS LASER,  
EXPLAINING FORCING-OF-OSCILLATIONS AND TRAVELING  
WAVE SUPPRESSION EFFECT A66-34685
- TRAVELING WAVES INTERACTION IN GAS LASER,  
EXPLAINING FORCING-OF-OSCILLATIONS AND TRAVELING  
WAVE SUPPRESSION EFFECT A67-14371
- FORMALDEHYDE
- MOLECULE REORIENTATION AND TRANSITION PROBABILITY  
IN MOLECULAR BEAM MASER USING FORMALDEHYDE  
A66-39662
- FOURIER TRANSFORM
- HOLOGRAPHY PRINCIPLES, DISCUSSING BASIC EQUATION,  
FOURIER TRANSFORM HOLOGRAMS AND HOLOGRAM  
INTERFEROMETRY A66-36929
- FOURIER TRANSFORM HOLOGRAPHY FOR DIFFUSION OF  
COHERENT LASER LIGHT BEAM, EXAMINING DISTORTION  
TERM IN RECONSTRUCTED IMAGE A67-11063
- LASER AS SOURCE OF OPTICAL FOURIER ANALYSIS OF  
ATOMIC STRUCTURE OF CRYSTALS A67-16921

## FRACTURE MECHANICS

THERMOELASTIC WAVE EQUATIONS IN CONTINUUM MECHANICS MODEL OF LASER-INDUCED FRACTURE IN TRANSPARENT MEDIA IN TERMS OF LASER BEAM ENERGY ABSORPTION A66-40089

TIME EVOLUTION OF LASER INDUCED FRACTURES IN GLASS, NOTING CRACK PROPAGATION ACCOMPANIED BY SPARKING A67-12508

FRACTURE MECHANISM OF TRANSPARENT CRYSTALS INTERACTING WITH RUBY LASER BEAM A67-13128

## FREE ELECTRON

TIME DEPENDENT SCHROEDINGER EQUATION FOR BLOCH ELECTRON IN PRESENCE OF LASER FIELD, USING WKB APPROXIMATION METHOD, COMPARED WITH PERTURBATION THEORY A66-41266

## FREE FLIGHT

NANOSECOND PULSE LIGHT SOURCES USED IN FREE FLIGHT HYPERSONICS FOR BALLISTIC RANGE MEASUREMENTS, NOTING LESS PHOTOGRAPHIC BLURRING OF MOTION A67-18881

## FREQUENCY

FREQUENCY STABILITY DETERMINATION FOR HYDROGEN MASERS N66-38554

## FREQUENCY AMPLIFIER

RAMAN GENERATOR FOR AMPLIFICATION AND GENERATION OF COHERENT RADIATION N67-11314

## FREQUENCY BAND

FREQUENCY SPECTRUM OF LASER IMPULSE IN Q-SWITCHING REGIME WIDER THAN THAT OF SINGLE IMPULSE RADIATED BY LASER IN ORDINARY REGIME A66-37141

## FREQUENCY CONTROL

FREQUENCY STABILIZATION OF GAS LASER BY SERVOMECHANISM AND LAMB DIP METHOD A66-33252

FREQUENCY STABILIZATION OF GAS LASER TO LOCK OUTPUT TO CENTER OF ATOMIC RESONANCE, USING ERROR SIGNAL A66-38241

DUAL CHANNEL TRAVELING WAVE HYDROGEN MASER FOR FREQUENCY GENERATION AND CONTROL N66-38555

AUTOMATIC FREQUENCY CONTROL SYSTEM FOR ABSOLUTE FREQUENCY STABILIZATION IER-5 N67-15312

DUAL CHANNEL TRAVELING WAVE MASER FOR INTEGRATION IN CLOSED CYCLE REFRIGERATOR N67-15908

## FREQUENCY CONVERSION

LASER FREQUENCY TUNING BY DIELECTRIC MATERIAL INTERACTION TO PRODUCE NONLINEAR EFFECTS A66-26867

OPTICAL FREQUENCY BREAKDOWN THRESHOLD OF INERT GAS MIXTURES, USING FOCUSED BEAM RADIATION FROM Q-SPOILED NEODYMIUM LASER A66-34236

FREQUENCY DOUBLING OF LASER LIGHT WITH VARIABLE Q-SWITCHED RESONATOR A66-39654

MICROWAVE MIXING IN PARAMAGNETIC CRYSTAL USING TRAVELING WAVE MASER WITH RUBY AS MIXER ELEMENT, NOTING FREQUENCY CONVERSION A67-10003

RUBY LASER FREQUENCY CONVERSION TECHNIQUE BY LASER BEAM SCATTERING AND MIXING OF COMBINED FREQUENCIES A67-13094

SUM AND DIFFERENCE FREQUENCY MIXING OF VISIBLE AND IR GAS LASER LIGHT IN GA P AT NEAR RESTSTRAHL FREQUENCIES AND RELATIONSHIP TO SPONTANEOUS RAMAN SCATTERING A67-15464

## FREQUENCY DISTRIBUTION

ATMOSPHERIC TURBULENCE EFFECT ON FREQUENCY SPECTRA OF LIGHT INTENSITY FLUCTUATIONS EXAMINED, USING HE- NE LASER A66-41031

## FREQUENCY MEASUREMENT

FREQUENCY TEMPERATURE DEPENDENCE OF LONGITUDINAL AND TRANSVERSE HYPERSONIC WAVE ABSORPTION COEFFICIENTS IN QUARTZ AND ARTIFICIAL RUBY CRYSTAL A66-42514

## FREQUENCY MODULATION

ATMOSPHERIC TURBULENCE EFFECTS ON LASER BEAM PROPAGATION, NOTING BEAM CROSS SECTION, PHASE VARIATION, AM AND FM, ETC A66-27035

ULTRASONIC CELL WHICH MODULATES INTENSITY OF HE- NE LASER BEAM FOR COMMUNICATION OF INTELLIGENCE A66-34059

COHERENT AND NONCOHERENT SEMICONDUCTOR LASERS FOR DEVELOPMENT OF FREQUENCY- AND PULSE-MODULATED COMMUNICATIONS SYSTEMS ESD-TDR-65-232 N66-25513

OPERATION AND IMPROVEMENT OF FREQUENCY MODULATED AND SUPER-MODE LASERS IER-3 N66-30672

PROPERTIES OF FM AND SUPER-MODE HELIUM-NEON LASERS, AND ABSOLUTE FREQUENCY STABILIZATION OF FM LASER IER-4 N66-35096

S HF MODULATION TECHNIQUES FOR LASER RADIATION, COVERING FARADAY, KERR AND POKEL EFFECTS, CIRCULAR DICHROISM, ETC A67-13138

FREQUENCY MODULATION OF GA AS SEMICONDUCTOR LASER BY ULTRASONIC WAVE MODULATION OF DIELECTRIC CONSTANT A67-16671

KERR CELL PROPERTIES NOTING FOUR-ELECTRODE CELL GIVING FREQUENCY SHIFT OF 60 MC FOR LASER BEAM A67-19552

ANALYSIS OF FREQUENCY MODULATION AND DEMODULATION METHODS FOR CONTINUOUS WAVE LASERS IN TERMS OF AMPLITUDE NOISE SENSITIVITY NASA-CR-668 N67-17358

## FREQUENCY MULTIPLIER

LIGHT FREQUENCY MULTIPLIERS FOR NONLINEAR OPTICAL EFFECTS AT VARIOUS WAVELENGTHS, CONSIDERING FOCUSING, LASER BEAM FINITE DIVERGENCE, AIR BREAKDOWN, STIMULATED RAMAN EMISSION, ETC A66-26146

U V RADIATION GENERATION FROM OUTPUT OF NO GLASS LASER BY FREQUENCY DOUBLING IN AMMONIUM DIHYDROGEN PHOSPHATE CRYSTALS A67-18712

## FREQUENCY RANGE

DEPENDENCE OF BEAT FREQUENCY OF NEODYMIUM LASER AXIAL MODES ON DISTANCE BETWEEN MIRRORS AND NEODYMIUM ROD POSITION WITHIN RESONATOR A66-41088

SINGLE MODE 6328 ANGSTROM UNITS HE- NE LASER HAVING SINGLE FREQUENCY POWER OUTPUT OF 50 MWATT STABILIZED BY FEEDBACK SYSTEM WHOSE OUTPUT IS NEITHER AMPLITUDE NOR FREQUENCY MODULATED A67-16685

IRON DOPED RUTILE TRAVELING WAVE MASER OPERATING IN 34-36 G HZ FREQUENCY RANGE A67-19605

TUNING RANGE EXTENSION OF KLYSTRONS USED FOR PUMPING S-BAND TRAVELING WAVE MASERS N67-14441

## FREQUENCY REGULATOR

COHERENT LASER-TYPE LIGHT GENERATORS WITH CAPABILITY OF ADJUSTING FREQUENCY OVER VISIBLE SPECTRUM A66-36265

TUNABLE DISPERSION RESONATOR AND BROADENING OF LASER EMISSION SPECTRAL RANGE TO OBTAIN OPERATING FREQUENCY OTHER THAN FUNDAMENTAL A67-13131

## FREQUENCY RESPONSE

OUTPUT POWER FREQUENCY RESPONSE OF SINGLE MODE HELIUM NEON LASER, DETERMINING EFFECTS OF ATOMIC COLLISIONS ON FREQUENCY RESPONSE OF INDIVIDUAL ATOMS A66-29812

TRANSVERSE AND AXIAL MAGNETIC FIELD EFFECTS ON GAS LASERS, DERIVING EXPRESSION FOR ATOMIC AND MACROSCOPIC POLARIZATION, DETERMINING OSCILLATION MODE CHARACTERISTICS, FREQUENCY RESPONSES, ETC A66-29813

AMPLITUDE AND FREQUENCY CHARACTERISTICS OF HYDROGEN-ATOM BEAM MASER A67-11574

## FREQUENCY SHIFT

FREQUENCY SHIFT IN RESONANCE TRANSITION INDUCED IN POTASSIUM VAPOR BY RUBY LASER PULSE A66-25103

MEASUREMENT OF SINGLE LINE IN P BRANCH OF CARBON DIOXIDE VIBRO-ROTATIONAL ABSORPTION BAND USING TUNED OPTICAL MASER SPECTROSCOPY, NOTING PRESENCE OF SHIFTED FREQUENCIES A66-28691

FREQUENCY SHIFT IN RESONANCE TRANSITION INDUCED IN POTASSIUM VAPOR BY RUBY LASER PULSE A66-30282

TUNING OF AMMONIA BEAM MASER RESONATOR BASED ON FREQUENCY SHIFT METHOD, NOTING HYSTERESIS APPEARANCE AND ELIMINATION A66-31696

PRESSURE- AND GAIN-DEPENDENT FREQUENCY SHIFT MEASUREMENTS IN STABILIZED 6328 ANGSTROM HE- NE LASER A66-42803

INTENSITY DEPENDENT FREQUENCY SHIFT IN SPECTRAL OUTPUT OF MONOCHROMATIC GIANT PULSE LASERS MEASURED, USING FABRY-PEROT INTERFEROMETER A67-10251

ISOTOPE SUBSTITUTION EFFECT ON NATURAL FREQUENCIES OF VIBRATIONAL-ROTATIONAL TRANSITIONS IN DIATOMIC AND TRIATOMIC MOLECULES AND GENERATION OF NEW IR MASER FREQUENCIES A67-16634

TRAVELING WAVE RUBY LASER AS RADAR TRANSMITTER NOTING POWER GAIN, COHERENCE, FREQUENCY SHIFT AND SINGLE MODE OF OPERATION A67-16657

OPTICAL HETERODYNE TECHNIQUE DETECTING STIMULATED BRILLOUIN SCATTERING, NOTING FREQUENCY SHIFT DEMODULATION ARISING FROM RUBY LASER LIGHT INCIDENCE ON QUARTZ CRYSTAL A67-16688

TEMPERATURE DEPENDENCE OF FLUORESCENT FREQUENCY SHIFT IN RUBY LASER FTD-TT-65-2006 N67-10978

## FREQUENCY STABILITY

FREQUENCY STABILITY OF DOUBLE BEAM AMMONIA LASER WITH THERMOSTATIC QUARTZ RESONATORS ON 3-2 LINE A67-10247

## FREQUENCY STANDARD

ATOMIC TIME STANDARDS, DESCRIBING CESIUM BEAM STANDARD, AMMONIA MASER AND GAS-CELL TYPE CLOCKS A66-35468

RUBY LASER WITH NONRESONANT FEEDBACK DUE TO RADIATION SCATTERING, SHOWING USE AS OPTICAL FREQUENCY STANDARD A67-16642

## FREQUENCY SYNCHRONIZATION

FREQUENCY STABILITY AND SPECTRAL PURITY OF P-N JUNCTION LASER OUTPUT IMPROVED BY SYNCHRONIZATION WITH GAS LASER BEAM A66-29717

WAVE SYNCHRONIZATION IN GAS LASER WITH RING RESONATOR CAVITY A66-39301

## FREQUENCY SYNTHESIS

FREQUENCY FLUCTUATIONS OF LASER FIELD DETERMINED BY MEASURING CROSS CORRELATION FUNCTION AT TWO POINTS A67-16625

RUBY AND NEODYMIUM GLASS LASERS SUM FREQUENCY GENERATION USING NONLINEAR ELECTRO-OPTICAL KDP

## CRYSTAL

A67-17754

## FREQUENCY TRANSLATION SYSTEM

OPTICAL FREQUENCY TRANSLATION OF PULSES FROM MODE LOCKED LASER, NOTING DOPPLER SHIFTS OF LARGE MAGNITUDE A67-12506

## FRESNEL DIFFRACTION

NEAR-FIELD DIFFRACTION OF HELIUM-NEON LASER AT CIRCULAR APERTURES A66-31727

SPATIAL COHERENCE OF LASER LIGHT BEAM AFTER EXTREME WAVEFRONT DISTORTIONS ON DIFFUSION EXPLAINED ON BASIS OF FRAUNHOFER AND FRESNEL DIFFRACTION A67-11062

## FUSION WELDING

LASER WELDING OF AEROSPACE STRUCTURAL ALLOYS AND RESULTANT JOINT PROPERTIES A66-26019

SOLID STATE LASER APPLICATION TO FUSION WELDING A66-40274

## G

## GAIN

SIMULTANEOUS DERIVATION OF OPTICAL GAIN FACTOR AND LOSS PER UNIT LENGTH OF SERIES OF SOLUTION GROWN DIFFUSED GA AS INJECTION LASER A67-11072

EFFECTS OF GAIN SATURATION BY STRONG TRAVELING FIELDS IN DILUTE LASER MEDIA, NOTING ATOMIC MOTION AND LINE BROADENING A67-20126

## GALLIUM ANTIMONIDE

OPTICAL EXCITATION IN INDIUM ARSENIDE AND GALLIUM ANTIMONIDE YIELDING LASER RADIATION A66-25438

LASER ACTION IN GALLIUM ANTIMONIDE DIODES, EXAMINING EMITTED LIGHT SPECTRUM VS INJECTED CURRENT, TEMPERATURE EFFECT, RADIATIVE EFFICIENCY, ETC A66-26184

MINIMUM SPECTRAL LINE WIDTH, THRESHOLD CURRENT DENSITY, RADIATION-PEAK DISPLACEMENT AND POSSIBLE RECOMBINATION MECHANISM FOR GA SB LASER DIODE P-N JUNCTIONS IN COHERENT RADIATION A66-31764

MINIMUM SPECTRAL LINE WIDTH, THRESHOLD CURRENT DENSITY, RADIATION-PEAK DISPLACEMENT AND POSSIBLE RECOMBINATION MECHANISM FOR GA SB LASER DIODE P-N JUNCTIONS IN COHERENT RADIATION A67-10085

## GALLIUM ARSENIDE

GALLIUM ARSENIDE LASER DIODE CHARACTERISTICS A66-25112

SOLAR NOISE IN OPTICAL COMMUNICATIONS, BACKGROUND RADIATION DEPENDENCE ON DETECTOR APERTURE, NOISE POWER AND APPLICATION TO GA AS DIODES AND GAS LASERS A66-25833

GALLIUM ARSENIDE P-N JUNCTION LASER DIODE, INJECTION CURRENT DISTRIBUTION, DENSITY AND EMISSION SPECTRA VARIATION A66-25934

PHOTOLUMINESCENCE AND STIMULATED EMISSION OF GALLIUM ARSENIDE AND INDIUM ANTIMONIDE OBTAINED BY OPTICAL PUMPING, NOTING EFFECT OF APPLIED MAGNETIC FIELD ON LASER AND DIODE EMISSIONS A66-26182

CORRELATIONS AND INTENSITY FLUCTUATIONS IN LIGHT FROM INDIVIDUAL LASING AND NONLASING MODES OF CW GA AS LASER AND THRESHOLD NOISE CHANGE IN LASER EMISSION A66-26210

COOLER FOR SEMICONDUCTOR LASERS AND PHOTODETECTORS USING LOW TEMPERATURE GAS A66-26559

MATHEMATICAL MODEL OF GA AS INJECTION LASER APPLIED IN DETERMINING MAXIMUM OBTAINABLE POWER OUTPUT, USING RATE EQUATIONS OF ELECTRON AND PHOTON DENSITIES AND THERMAL RESISTANCE FOR OPTIMUM VALUE A66-26572

- SUPERRADIANCE IN N-TYPE GALLIUM ARSENIDE AT ROOM TEMPERATURE EXCITED BY ELECTRON BEAM  
A66-27028
- SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION  
A66-27187
- TIME PARAMETERS OF POWERFUL LASER MEASURED WITH GA AS PHOTODIODE, NOTING TIME CONSTANT AND TIME RESOLUTION OF PHOTODIODE  
A66-27750
- OPTICALLY CONNECTED LASER CONSTRUCTED ON GALLIUM ARSENIDE P-N JUNCTION, NOTING COHERENT RADIATION  
A66-28262
- SPONTANEOUS EMISSION AND TRANSVERSE GAIN MEASUREMENTS IN GA AS INJECTION LASER AT 80 DEGREES K AND FOR 8466 ANGSTROM WAVELENGTH  
A66-28627
- GALLIUM ARSENIDE LASER DESIGN USING P-N JUNCTION OBTAINED BY DIFFUSION OF ZINC IN TELLURIUM DOPED N- GA AS SINGLE CRYSTAL  
A66-29057
- SPONTANEOUS AND COHERENT PHOTOLUMINESCENCE IN CADMIUM MERCURY TELLURIDE CRYSTALS EXCITED OPTICALLY BY GA AS DIODE LASER  
A66-29390
- DISLOCATIONS AND PRECIPITATES IN GA AS INJECTION LASERS REVEALED BY NEW A-B ETCHANT  
A66-31071
- LASER CAVITY OUTPUT OPTIMIZATION FOR MAXIMUM EXTERNAL QUANTUM EFFICIENCY SHOWING DEPENDENCE ON LENGTH AND REFLECTIVITY FOR GIVEN CURRENT DENSITY  
A66-31535
- P-N JUNCTION LASERS FOR SHORT RANGE COMMUNICATIONS, EXAMINING DESIGN, TECHNOLOGICAL PROBLEMS AND PERFORMANCE  
A66-31956
- SELECTIVE DIFFUSED JUNCTION LASER, DISCUSSING GA AS LASER USED FOR QUENCHING EXPERIMENT  
A66-32408
- LARGE WAVELENGTH CHANGES IN GALLIUM ARSENIDE INJECTION LASERS DUE TO CHANGES IN CAVITY Q  
A66-32635
- INTENSITY NOISE IN MULTIMODE GA AS LASER EMISSION  
A66-32689
- SCANNING ELECTRON MICROSCOPE TO EXAMINE CRYSTAL MOSAIC STRUCTURES AND LASING PROPERTIES OF GALLIUM ARSENIDE LASER DIODES  
A66-33300
- OPTICAL MODULATION IN BULK GALLIUM ARSENIDE, USING GUNN EFFECT  
A66-33606
- GALLIUM ARSENIDE DIODE LASER AS PULSED IR SOURCE FOR EXPERIMENT AND DESIGN CONSIDERATIONS FOR RADAR INDICATION OF CLOUD HEIGHT AND VISIBILITY  
A66-33616
- COHERENT AND SPONTANEOUS EMISSION FROM LEAD-TIN TELLURIDE ALLOYS UPON EXCITATION BY GA AS DIODE LASER, NOTING BAND STRUCTURE OF ALLOY SYSTEM  
A66-34159
- ORIENTATION EFFECT IN GA AS INJECTION LASERS, NOTING EMISSION CHARACTERISTICS AND STRUCTURAL SPECTRA  
A66-35404
- GALLIUM ARSENIDE LASER EXCITATION BY FAST ELECTRONS  
A66-35760
- GALLIUM ARSENIDE LASERS OPERATING AT ROOM TEMPERATURE INVESTIGATED, BASED ON DIFFUSION P-N JUNCTIONS, DISCUSSING EMISSION SPECTRUM  
A66-36070
- REPLACING HEATED TUNGSTEN FILAMENT AND IR FILTER BY GA AS ELECTROLUMINESCENT DIODE WITHOUT FILTER FOR IR ILLUMINATION  
A66-36266
- CRYSTAL GROWTH, DIFFUSION AND FABRICATION OF GALLIUM ARSENIDE-PHOSPHIDE JUNCTION LASERS WITH
- LOW THRESHOLD CURRENT DENSITIES  
A66-37401
- AVALANCHE TRANSISTOR GENERATION OF JITTER-FREE NANOSECOND CURRENT PULSES FOR DRIVING GA AS LASER DIODES AT LOW TEMPERATURES  
A66-37453
- POLARIZATION OF PULSED RADIATION FROM GA AS LASER DIODE TO DETERMINE ORIGIN OF NATURAL OSCILLATIONS OF RESONATOR  
A66-37549
- IMPURITY CONCENTRATION EFFECT ON MAXIMUM CONTINUOUS WAVE POWER FROM GALLIUM ARSENIDE LASERS AT 77 DEGREES K  
A66-37782
- GAIN FACTOR VARIATION WITH THRESHOLD CURRENT IN REFLECTIVE AND ANTIREFLECTIVE FILMS OF GA AS LASER WITH PHOTON AND CURRENT DENSITIES  
A66-38388
- OPTICAL COUPLING USING GALLIUM ARSENIDE LASER FOR VARIATION OF FREQUENCY OF DIODE EMISSION THROUGH SMALL CHANGE IN CURRENT DENSITY  
A66-38920
- PERFORMANCE OF GA AS SEMICONDUCTOR LASER WITH RESONATOR, NOTING DEPENDENCE OF FORBIDDEN ZONE WIDTH AND ABSORPTION COEFFICIENT ON FREE CARRIER CONCENTRATION AND INCIDENT PHOTON ENERGY  
A66-38955
- MODULATION BY ULTRASONIC DIFFRACTION OF 10.6 MICRON LASER RADIATION IN PHOTOELASTIC CD S<sub>2</sub>, GA AS AND SI CRYSTALS  
A66-39112
- FAR-FIELD LIGHT EMISSION MODE PATTERN OF GA AS DIODE INJECTION LASERS, DIELECTRIC GRADIENT IN INVERSION LAYER AND REFRACTIVE INDEX IN JUNCTION  
A66-39743
- SPONTANEOUS AND STIMULATED EMISSION FROM GA AS DIODES WITH THREE-LAYER STRUCTURES CONSISTING OF N-N-P, N-I-P OR N-P-P DIODES  
A66-40102
- RECOMBINATION RADIATION FROM GA AS P-N JUNCTIONS WITH AND WITHOUT FABRY-PEROT RESONATOR, NOTING PARAMETER DEPENDENCE ON CURRENT DENSITY  
A66-40314
- GA AS SEMICONDUCTOR QUANTUM GENERATOR HEATING DURING INJECTION PULSE, ANALYZING TEMPERATURE EFFECT ON EXTERNAL QUANTUM OUTPUT AND GENERATOR EFFICIENCY  
A66-41621
- GA AS CRYSTAL AS ELECTRO-OPTIC MODULATOR AT 10.6 MICRONS DUE TO SMALL CARRIER ABSORPTION, FREEDOM FROM INTERBAND TRANSITIONS AND HIGH RESISTIVITY  
A66-42553
- TRANSVERSE GAIN AND SPONTANEOUS AND STIMULATED EMISSION AT 8466 ANGSTROMS IN GA AS STRUCTURES  
A66-42561
- I R GA AS LASER AMPLIFIER WITH GAINS AS HIGH AS 2000, OUTPUT POWERS OF 150 MW AND SATURATION OCCURRING WITH CURRENT INCREASE AT LOW LIGHT LEVELS  
A66-42562
- SEMICONDUCTOR LASER TECHNOLOGY, OPERATING PRINCIPLES, MATERIAL PROPERTIES AND PERFORMANCE, WITH EMPHASIS ON GA AS JUNCTION LASERS  
A66-42802
- SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION  
A66-43085
- GALLIUM ARSENIDE INJECTION LASER OPTIMIZATION FOR MAXIMUM POWER OUTPUT  
E66-2613  
N66-24779
- FABRICATION OF GALLIUM ARSENIDE LASER DIODES BY DIFFUSION  
AD-478538  
N66-28726
- MERCURY WETTED RELAY PULSE GENERATOR AND PULSE TRANSFORMER TO DRIVE GALLIUM ARSENIDE LASERS IN FAST PULSE MODE  
HDL-TM-66-3  
N66-34246



- SEMICONDUCTOR GALLIUM-ARSENIDE LASER WITH FLAT RESONATOR N66-36291
- SYNTHESIS, JUNCTION FABRICATION, AND LUMINESCENT OPERATION OF GALLIUM-ARSENIDE-PHOSPHIDE SEMICONDUCTORS  
AFCRL-66-245 N66-36868
- THRESHOLD AND POWER CHARACTERISTICS OF GALLIUM ARSENIDE DIODE LASER OPERATING IN PULSED REGIME  
A67-10066
- VOLT-AMPERE CHARACTERISTICS AND OTHER PROPERTIES OF GA AS LASERS WITH TELLURIUM AND ZN-DOPED EPITAXIAL P-N JUNCTION A67-10080
- CURRENT INJECTION EFFECT ON TIME DELAY OF GA AS LASER RADIATION A67-10083
- TIME VARIATION IN INTENSITY OF LIGHT EMITTED FROM CW GA AS LASER DIODES A67-10243
- CONTINUOUS COHERENT RADIATION OF GA AS SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT AMBIENT TEMPERATURE OF 77 DEGREES K A67-10548
- CONTINUOUS COHERENT RADIATION OF GA AS SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT AMBIENT TEMPERATURE OF 77 DEGREES K A67-11056
- SIMULTANEOUS DERIVATION OF OPTICAL GAIN FACTOR AND LOSS PER UNIT LENGTH OF SERIES OF SOLUTION GROWN DIFFUSED GA AS INJECTION LASER A67-11072
- VOICE COMMUNICATIONS SYSTEM USING GA AS ROOM-TEMPERATURE INJECTION LASER AND TV COMMUNICATIONS SYSTEM USING GA AS CRYSTALS AS MODULATORS FOR LASER BEAMS A67-11786
- AVALANCHE TRANSISTOR PULSER DESIGNED TO DRIVE GA AS RADAR-LASER DIODE A67-12964
- THRESHOLD CURRENT DENSITY DEPENDENCY ON PHOTON ENERGY IN GALLIUM ARSENIDE LASER DIODES A67-13480
- I- V CHARACTERISTIC OF GA AS DIODE WITH FABRY-PEROT RESONATOR, NOTING VARIATIONS DURING AMPLIFICATION TO GENERATION TRANSITION A67-15132
- SURFACE ASPECTS OF THERMAL DEGRADATION OF GA AS P-N JUNCTION LASERS AND TUNNEL DIODES A67-15620
- PERFORMANCE OF GA AS SEMICONDUCTOR LASER WITH RESONATOR, NOTING DEPENDENCE OF FORBIDDEN ZONE WIDTH AND ABSORPTION COEFFICIENT ON FREE CARRIER CONCENTRATION AND INCIDENT PHOTON ENERGY A67-15759
- OPTICAL COUPLING USING GALLIUM ARSENIDE LASER FOR VARIATION OF FREQUENCY OF DIODE EMISSION THROUGH SMALL CHANGE IN CURRENT DENSITY A67-16390
- LINE WIDTH OF CW GA- AS LASERS MEASURED USING HOMODYNE DETECTION AND AUTOCORRELATION A67-16670
- SHALLOW DONOR INTRODUCTION IN P-TYPE GA- AS LASER RESULTS IN INCREASED EFFICIENCY OF RADIATIVE RECOMBINATION A67-17280
- ELECTRON BEAM SPATIAL SCANNING OF COHERENT EMISSION OF GA AS JUNCTION LASER AT LOW TEMPERATURES, MAKING CURRENT DISTRIBUTION NONUNIFORM A67-18150
- SEMICONDUCTOR LASERS USING SINGLE AND DOUBLE PHOTON OPTICAL EXCITATION A67-18930
- RECOMBINATION RADIATION OF P-N JUNCTIONS IN GA AS WITH AND WITHOUT FABRY-PEROT CAVITY, DISCUSSING NONEQUILIBRIUM CURRENT CARRIER KINETICS AND I-V CHARACTERISTICS A67-18934
- GA AS ROOM TEMPERATURE LASER DIODE APPLICATION TO COMMUNICATION AND RADAR SYSTEMS A67-19086
- PICOSECOND LASER PULSE WIDTHS MEASUREMENT BY METHOD USING SPECIAL SYMMETRY PROPERTIES OF SECOND HARMONIC GENERATION AT GA AS CRYSTAL SURFACE A67-20097
- SEMICONDUCTOR LASERS FOR DIGITAL COMPUTER CIRCUITS N67-13063
- GALLIUM ARSENIDE LASER RADAR AND RANGEFINDING AT ROOM TEMPERATURE  
HDL-TM-66-13 N67-16144
- GALLIUM COMPOUND  
P- N JUNCTION, ELECTROMAGNETIC WAVES OF GALLIUM ARSENIDE SEMICONDUCTOR LASER  
FTD-TT-65-891/18284 N66-30510
- GALLIUM PHOSPHIDE  
SYNTHESIS, JUNCTION FABRICATION, AND LUMINESCENT OPERATION OF GALLIUM-ARSENIDE-PHOSPHIDE SEMICONDUCTORS  
AFCRL-66-245 N66-36868
- SUM AND DIFFERENCE FREQUENCY MIXING OF VISIBLE AND IR GAS LASER LIGHT IN GA P AT NEAR RESTSTRAHL FREQUENCIES AND RELATIONSHIP TO SPONTANEOUS RAMAN SCATTERING A67-15464
- GARNET  
LASER EXCITED ELECTRONIC RAMAN SPECTRUM OF TRIVALENT EU ION DOPED Y GA GARNET A67-11084
- GAS  
VELOCITY DISTRIBUTION FUNCTION MEASUREMENT OF GAS BASED ON LASER BEAM ATTENUATION  
SUDAAR-275 N67-18270
- GAS CELL  
ATOMIC TIME STANDARDS, DESCRIBING CESIUM BEAM STANDARD, AMMONIA MASER AND GAS-CELL TYPE CLOCKS A66-35468
- GAS CHROMATOGRAPHY  
FOCUSED LASER COHERENT RADIATION-INDUCED DEGRADATION OF SOLID METHYLENE AND GAS CHROMATOGRAPHIC ANALYSIS OF REACTION PRODUCTS A66-31870
- LASER MATERIALS, GAS CHROMATOGRAPH-MASS SPECTROMETER COMBINATION, AND RESEARCH IN CHEMISTRY, METALLURGY, CERAMICS, OPTICAL PHYSICS, RADIO, AND SOLID STATE PHYSICS  
PB-169690 N66-28514
- GAS DISCHARGE  
LASER PUMPING BY INTENSE NOBLE GAS DISCHARGE IN ZETA-PINCH GEOMETRY A66-25995
- PLASMA RESONANCE AND SCATTERING, THRESHOLD VARIATION AND OPTICAL REFLECTIVITY IN PULSED LASER BEAM-INDUCED GAS BREAKDOWN A66-26192
- GROWTH RATE OF IONIZATION BY ELECTRON IMPACT IN PRESENCE OF LASER BEAM, ELASTIC AND INELASTIC SCATTERING CROSS SECTIONS, FREE-FREE ABSORPTION, EXCITATION AND IONIZATION COEFFICIENTS, BREAKDOWN TIMES AND THRESHOLDS A66-26193
- CURRENT CHANGES IN GAS DISCHARGE AS AFFECTED BY LASING ACTION A66-27055
- RADIATIVE CASCADE PATTERNS IN HELIUM-NEON GAS SYSTEM USING IDEALIZED MODEL, COMPUTING SPONTANEOUS DECAYS WHICH ARE COMPARED WITH LASER EXPERIMENTS A66-28699
- C W IR LASER OSCILLATION IN ATOMIC CL IN H CL AND HI GAS DISCHARGES, NOTING USE OF TWO POWER SUPPLIES AND ENERGY LEVEL DIAGRAM A66-28880
- HIGH VOLTAGE PULSED ELECTRODELESS DISCHARGE IN RARE GAS AS LIGHT SOURCE FOR RUBY AND ND GLASS LASER EXCITATION AND OBSERVATION OF OUTPUT

- CHARACTERISTICS A66-31448
- ALUMINA HIGH TEMPERATURE GAS DISCHARGE TUBE FOR INVESTIGATION OF PULSED METAL VAPOR LASER OSCILLATIONS A66-35810
- DISCHARGE CURRENT AND LASER LIGHT NOISE MEASUREMENTS EFFECT IN GAS DISCHARGE HELIUM-NEON LASER, USING EQUIVALENT CIRCUIT A66-38240
- PASCHEN SERIES LASER LINES IN ATOMIC AND MOLECULAR HYDROGEN A66-40892
- SPECTRAL ANALYSIS OF LASER DISCHARGE IN PURE AND IMPURE HE, OBTAINING SPECTRA OF SPARK AT VARIOUS PRESSURES, DETERMINING ELECTRON CONCENTRATION AT VARIOUS STAGES A66-40946
- GAS DISCHARGE BY LASER PULSE, TAKING INTO ACCOUNT PHOTOIONIZATION DUE TO ELECTRON IMPACT A66-41094
- GAS-DISCHARGE CW LASERS, PARTICULARLY HE- NE, CARBON DIOXIDE, ARGON-ION AND PULSED SELF-TERMINATING LASERS, DISCUSSING CLASSIFICATION, POWER OUTPUT AND GAIN, DOPPLER WIDTH, COHERENCE AND NOISE A66-42801
- RUBY LASER INDUCED BREAKDOWN IN OXYGEN GAS AT HIGH PRESSURE N66-35531
- THREE NEW VISIBLE CW LASER LINES IN DISCHARGE IN SINGLY-IONIZED CL A67-10373
- ARGON DISCHARGE CHARACTERISTICS USED IN CONTINUOUS ACTION ION LASER FOR ANALYSIS OF INVERSION PRODUCTION MECHANISM A67-16680
- DOUBLE PROBE AND MICROWAVE RESONANCE MEASUREMENTS OF GAS ADDITIVES EFFECT ON RADIAL VARIATION OF ELECTRON TEMPERATURE AND DENSITY WITH PARTIAL PRESSURES IN CARBON DIOXIDE-NITROGEN-HELIUM GAS LASER A67-17274
- PUMPING MEDIUM POWER LASERS USING ARTIFICIAL METEORS TO PRODUCE INTENSE GAS GLOW IN COMPRESSION WAVE A67-17757
- OPTICAL MASER OSCILLATION LINES IN HF DISCHARGE IN MIXTURE OF AR AND BR A67-18545
- LASER STUDIES AT RCA VICTOR RESEARCH LABORATORIES, MONTREAL, DISCUSSING SPECTROSCOPIC, INTERFEROMETRIC AND PLASMA DIAGNOSTIC RESEARCH A67-19082
- RATE EQUATIONS FOR GAS DISCHARGE MODULATION OF HE- NE LASER A67-19492
- GAS DISSOCIATION**
- ELECTRICAL BREAKDOWN OF GASES BY OPTICAL FREQUENCY RADIATION, NOTING LASER BEAM ATTENUATION AND SUBSEQUENT ENERGY ABSORPTION BY PLASMA A66-26190
- LASER INDUCED BREAKDOWN OF COMPLEX ORGANIC MOLECULES IN VAPOR STATE, NOTING EMISSION ACCOMPANIED BY FORMATION OF PARTIALLY DISSOCIATED HOT GAS A67-12451
- GAS DYNAMICS**
- BEAM SCATTERING, INTERFEROMETRY, AND NONLINEAR GAS EFFECT STUDIES IN GASEOUS MATTER-LASER BEAM INTERACTION EXPERIMENTS REPT.-662 N66-37871
- GAS DYNAMIC EQUATIONS FOR DETERMINATION OF HEATING, VAPORIZATION AND EXPANSION OF SUBSTANCE DUE TO Q-SWITCHED LASER RADIATED COLLIMATES ONTO SURFACE OF SOLIDS A67-16652
- LASER RADIATION EFFECT ON HEATING PROCESS AND GAS DYNAMIC MOTION OF FINITE TRANSPARENT GAS AND MOTIONLESS COLD GAS AT VACUUM INTERFACE A67-17008
- GAS FLOW**
- GAS LENS FOCUSING OF LIGHT BEAMS, USING HIGHLY TRANSPARENT GAS WITH WEAKLY VARYING REFRACTIVE INDEX TO GUIDE COHERENT TRANSMISSION WITH SMALL LOSSES A67-19789
- GAS HEATING**
- BREAKDOWN OF GASES UNDER INFLUENCE OF LASER SPARK PHENOMENA WITH SUBSEQUENT ABSORPTION OF LASER RADIATION AND GAS HEATING A66-32061
- LASER RADIATION EFFECT ON HEATING PROCESS AND GAS DYNAMIC MOTION OF FINITE TRANSPARENT GAS AND MOTIONLESS COLD GAS AT VACUUM INTERFACE A67-17008
- GAS LASER**
- OPTICAL RESONATOR DIFFRACTION LOSS, NOTING LASER OSCILLATIONS IN HIGH LOSS ARRANGEMENTS, OUTPUT BEAM POWER, FIELD PATTERNS, ETC A66-25195
- NONLINEAR DIELECTRIC LASER LIGHT ABSORPTION BY NEUTRAL GAS RESULTING IN AVALANCHE BREAKDOWN OF GAS DUE TO THERMAL IONIZATION A66-25425
- METAL WALL IONIZED ARGON LASERS, DISCUSSING USE OF WATER-COOLED QUARTZ DISCHARGE CHANNELS, CW LASERS, DEVELOPMENT OF SATISFACTORY METAL, ETC A66-25555
- OUTPUT POWER OF 6328 ANGSTROM HE- NE GAS LASER AS FUNCTION OF LASER GAIN, CAVITY LOSS AND OUTPUT COUPLING A66-25651
- ALIGNMENT OF LASER MIRRORS USING GAS LASER WITH HIGHLY COLLIMATED BEAM OF SMALL DIAMETER A66-25824
- SOLAR NOISE IN OPTICAL COMMUNICATIONS, BACKGROUND RADIATION DEPENDENCE ON DETECTOR APERTURE, NOISE POWER AND APPLICATION TO GA AS DIODES AND GAS LASERS A66-25833
- HELIUM-NEON LASER MULTIBEAM GENERATION IN GAS DISCHARGE TUBE, USING SPHERICAL MIRRORS AND TAPERED PLATES A66-26053
- HE- NE LASER HOMODYNE SPECTROMETER OBSERVATION OF BROADENING OF SPECTRAL PROFILE OF LIGHT SCATTERED FROM CARBON DIOXIDE NEAR CRITICAL TEMPERATURE AND DENSITY DUE TO DENSITY FLUCTUATIONS A66-26168
- FAR- IR LASER MOLECULAR SPECTROSCOPY INCLUDING IR LASER OSCILLATORS, PHOTON NOISE, DETECTORS AND NUCLEAR OPTICS A66-26195
- OPTICAL- AND I R-MASER SPECTROSCOPY OF INHOMOGENEOUSLY BROADENED RESONANCES, USING GAS LASERS A66-26196
- ORGANIC GAS MAGNETICALLY TUNED LASER SPECTROSCOPY, DISCUSSING RESOLUTION, ABSORPTION SPECTRA AND VIBRATIONAL DEACTIVATION A66-26197
- HELIUM-NEON GAS LASER USED TO STUDY PRESSURE EFFECT ON LINE SHAPE OF 2S-2P OPTICAL TRANSITIONS OF NEON EXCITED STATES A66-26198
- PRESSURE EFFECTS IN FABRY- PEROT LOSSY-CAVITY GAS LASER OUTPUT A66-26199
- DEPENDENCE OF ZEEMAN BEAT FREQUENCY ON INTERFEROMETER TUNING IN SINGLE-MODE HE- NE LASER WITH VARIOUS GAS PRESSURES AND MAGNETIC FIELD STRENGTHS A66-26201
- LASER ACTION ON VIBRATIONAL-ROTATIONAL TRANSITIONS AND VIBRATION ENERGY TRANSFER A66-26204
- ELECTRON IMPACT EXCITATION MECHANISM OF ARGON-ION CONTINUOUS AND LONG PULSE LASERS A66-26206
- TRANSITION PROBABILITIES AND LIFETIMES IN IONIZED ARGON GAS LASERS A66-26207
- HIGH RESOLUTION PIEZOELECTRICALLY SCANNED FABRY-PEROT INTERFEROMETER USED TO STUDY GAIN PROFILES, MODE STRUCTURES AND EMISSION LINE WIDTHS OF CW

- AR, KR AND Xe ION LASERS AND HG- HE PULSED LASER A66-26208
- PHOTOELECTRON-COUNTS OF PHOTOMULTIPLIER ILLUMINATED BY GAS LASER LIGHT SOURCE A66-26211
- MODELS OF MATTER-ELECTROMAGNETIC FIELD INTERACTION FOR GAS LASERS, USING PERTURBATION THEORY A66-26216
- HELIUM-NEON GAS LASER USED TO DETERMINE ELECTRON DENSITY VARIATION, SPATIAL AND TEMPORAL, IN AFTERGLOW OF Z-PINCH IN H AT 100 MTORR A66-26239
- MAGNITUDE AND PHASE OF COMPLEX SPATIAL COHERENCE OF HE- NE LASER BEAM A66-26334
- HELIUM-NEON LASER EMISSION ON 6401 ANGSTROM LINE, NOTING INTENSITY VS MIRROR SHIFT AND OPTICAL CAVITY INSTABILITY A66-26336
- RAMAN DIFFUSION SPECTRA FROM CRYSTALS EXCITED BY GAS LASER A66-26345
- ALIGNMENT OF ANGULAR POSITIONS OF SPHERICAL MIRROR AND GRATING OF FASTIE- EBERT SPECTROMETER, USING BRIGHT COLLIMATED MONOCHROMATIC BEAM OF HE- NE LASER A66-26564
- MAXIMUM OUTPUT POWER APPROXIMATED FOR 6328 ANGSTROM HE- NE GAS LASER, NOTING OPTIMUM MIRROR TRANSMISSION AND LASER GEOMETRY A66-26571
- CATAPHORESIS, MOVING STRIATIONS AND ASSOCIATED NOISE IN HE- NE LASER A66-26591
- DUST PARTICLES IN LASER CAVITY OBSERVED FOR ANGULAR STABILIZATION AND CONSTANT VELOCITIES A66-26594
- I R AND VISIBLE HELIUM-NEON LASER MODULATION USING FARADAY ROTATION IN YIG A66-26881
- VIBRATIONAL-ROTATIONAL LINE STRENGTHS AND WIDTHS IN CARBON DIOXIDE, USING CARBON DIOXIDE-NEON LASER A66-27030
- CURRENT CHANGES IN GAS DISCHARGE AS AFFECTED BY LASING ACTION A66-27055
- EFFECTIVE LIFETIME OF EXCITED STATE OF GAS LASER, WITH ACCOUNT OF NEAR PHOTON TRANSFER A66-27135
- EFFECT OF LONGITUDINAL MAGNETIC FIELD ON OUTPUT POWER OF GAS LASER OPERATING IN IR SPECTRUM, NOTING GAS-MIXTURE PRESSURE IN DISCHARGE TUBE ROLE A66-27156
- L F FLUCTUATIONS IN EMISSION OF HE- NE GAS LASER MEASURED, USING FABRY- PEROT RESONATOR AND RING-TYPE RESONATOR A66-27186
- LATERAL SHEARING INTERFEROMETER WITH GAS-LASER LIGHT SOURCE FOR TESTING LARGE OPTICAL SYSTEMS A66-27320
- HELIUM-NEON LASER AFTERGLOW AND METASTABLE HELIUM ATOMS UNDER LONG PULSE EXCITATION A66-27335
- LASER OSCILLATOR STUDY OF COHERENT STIMULATED EMISSION OF IR TRANSITIONS IN RARE GASES A66-27336
- OSCILLATION TYPES FOR GAS-LASER SEMICONCENTRIC RESONATOR A66-28160
- PRECISION AUTOMATIC TRACKING USING CW HE- NE LASER, NOTING PERFORMANCE AND APPLICATION A66-28448
- OPTICAL BEAM DEFLECTION TECHNIQUE USING INTERFEROMETER CAVITY ILLUMINATED BY GAS LASER BEAM A66-28689
- OPTICAL BEAM SCATTERING OF GAS LASER FOR MEASUREMENT OF PHOTOELASTIC CONSTANTS AND APPLICATION TO LITHIUM NIOBATE A66-28692
- TEMPERATURES, LORENTZIAN WIDTHS AND DRIFT VELOCITIES OF EXCITED NEUTRAL AND IONIC SPECIES IN ARGON-ION LASER, NOTING THERMAL EQUILIBRIUM ACHIEVEMENT A66-28695
- GAS LASER OUTPUT WAVELENGTH STABILIZATION BY USE OF EXTERNAL PASSIVE OPTICAL INTERFEROMETER A66-28835
- PULSED TOROIDAL EXCITATION OF GAS ION LASERS EXTENDED TO DRIVE HIGH POWER CW LASER TRANSITIONS IN AR, KR, CL AND BR, NOTING OPERATING PARAMETERS AND POWER OUTPUT A66-28877
- MARK I SMASER DESIGN, SUBMILLIMETER WAVE GAS LASER CAPABLE OF CONTINUOUS WAVE OR PULSE OPERATION A66-29009
- 118-MICRON WAVELENGTH WATER VAPOR GAS LASER WITH 4-INCH DIAMETER TWO-METER FOCAL LENGTH MIRROR RESONATOR SYSTEM A66-29010
- EXPERIMENTAL EVIDENCE OF INVERSE BREMSSTRAHLUNG AND ELECTRON-IMPACT IONIZATION IN LOW PRESSURE ARGON IONIZED BY GIANT PULSE LASER A66-29115
- DIPOLE MOMENT CALCULATION FOR GAS LASER IN MAGNETIC FIELD A66-29348
- RELATION BETWEEN LASER PARAMETERS AND CATHODE DIAMETER IN EXCITATION OF HE- NE MIXTURE BY DISCHARGE OF HOLLOW CYLINDER A66-29357
- PULSED NITROGEN LASER ACTION IN WIND TUNNEL-SIMULATED SUPERSONIC FLOW A66-29384
- HYSTERESIS PHENOMENA IN HE- NE GAS LASER IN AXIAL MAGNETIC FIELD AND POLARIZATION OF OSCILLATING MODE WITHIN CERTAIN TUNING REGION A66-29385
- FREQUENCY STABILITY AND SPECTRAL PURITY OF P-N JUNCTION LASER OUTPUT IMPROVED BY SYNCHRONIZATION WITH GAS LASER BEAM A66-29717
- OUTPUT POWER FREQUENCY RESPONSE OF SINGLE MODE HELIUM NEON LASER, DETERMINING EFFECTS OF ATOMIC COLLISIONS ON FREQUENCY RESPONSE OF INDIVIDUAL ATOMS A66-29812
- TRANSVERSE AND AXIAL MAGNETIC FIELD EFFECTS ON GAS LASERS, DERIVING EXPRESSION FOR ATOMIC AND MACROSCOPIC POLARIZATION, DETERMINING OSCILLATION MODE CHARACTERISTICS, FREQUENCY RESPONSES, ETC A66-29813
- ISOTOPE SHIFTS AND FERMI RESONANCE ROLE IN CARBON DIOXIDE IR LASER A66-30176
- ACTUAL LINE SHAPE EXPECTED FROM ACCELERATING RADIATING ION, ERRORS DUE TO LORENTZIAN APPROXIMATION AND RESULTS FOR ION LASER TRANSITION IN RARE GAS LASERS A66-30181
- OPTICAL HARMONIC GENERATION IN IR IN ZINC BLENDE, HEXAGONAL AND TRIGONAL CRYSTALS, USING UNFOCUSED CARBON DIOXIDE LASER IN CW AND Q-SWITCHED OPERATION A66-30182
- UNMODULATED LASER OUTPUT AT CONTROLLED FREQUENCY, USING CORRECTING BEATS FROM REFERENCE LASER A66-30205
- DEMODULATION METHOD IN WHICH PHASE MODULATION OF LASER BEAM IS CONVERTED TO AMPLITUDE MODULATION BY AUTOCORRELATION A66-30616
- NEAR- BOSE- EINSTEIN PROBABILITY DISTRIBUTION OF PHOTOELECTRON COUNTS PRODUCED BY HE- NE GAS LASER NARROW BAND GAUSSIAN LIGHT SOURCE OPERATING SLIGHTLY BELOW OSCILLATION THRESHOLD A66-30645
- SEMICLASSICAL THEORY OF QUANTUM GENERATORS,

- EXAMINING LASER SYSTEM RESPONSE TO EFFECT OF MONOCHROMATIC STANDING WAVE BASED ON KINETIC EQUATION FOR DENSITY MATRIX A66-30865
- COLLISION BROADENED LINEWIDTH AND SATURATION PARAMETERS FOR 6328 ANGSTROM TRANSITION OF NE IN HE- NE LASER A66-31084
- MODE LOCKING IN GASEOUS LASER WHOSE CAVITY IS LENGTH MODULATED AT MODE SEPARATION FREQUENCY A66-31095
- SMALL SIGNAL MODULATION EFFECT ON PHOTOELECTRON COUNTING OF HE- NE LASER INTENSITY FLUCTUATIONS A66-31097
- LARGE SCREEN REAL TIME PROJECTION DISPLAY TECHNIQUE USING NE- HE GAS LASER A66-31412
- PARTICLE VELOCITY IN GAS PARTICLE TWO-PHASE NOZZLE EXPANSION USING GAS LASER AND FABRY- PEROT INTERFEROMETER FOR ROCKET ENGINE PROPULSION AIAA PAPER 66-522 A66-31500
- HELIUM-NEON LASER MODULATION BY POSITIVE AND NEGATIVE VOLTAGE PULSES A66-31559
- GAS LASERS FOR INTERFEROMETRIC MEASUREMENTS OF LENGTHS, NOTING METHODS THAT STABILIZE WAVELENGTHS OF LASERS A66-31697
- NEAR-FIELD DIFFRACTION OF HELIUM-NEON LASER AT CIRCULAR APERTURES A66-31727
- MULTIPHOTON PLASMA PRODUCTION AND STIMULATED RECOMBINATION RADIATION IN LEAD TELLURIDE, CONSIDERING ELECTRON-HOLE PAIR PRODUCTION RATE A66-31884
- CYCLOTRON RESONANCE EXCITATION OF UPPER LEVEL OF GAS-ION LASER A66-31937
- STATIC CHARACTERISTICS OF GAS LASER INTERNAL MODULATION CIRCUIT, USING ELECTRO-OPTICAL CRYSTAL INSERTED INTO GAS LASER RESONATOR A66-32225
- GAS LASER EMISSION IN WEAK LONGITUDINAL MAGNETIC FIELD ASSUMING ZEEMAN SPLITTING IS MUCH SMALLER THAN DOPPLER LINEWIDTH A66-32319
- LASER AND MASER DEVELOPMENT, DISCUSSING DESIGN IMPROVEMENTS AND APPLICATION FOR TELEVISION, SPACE COMMUNICATIONS, ETC A66-32353
- FLUCTUATIONS IN MEAN REFRACTIVE INDEX OVER LONG PATH THROUGH TURBULENT ATMOSPHERE EXAMINED, USING MICHELSON INTERFEROMETER WITH HE- NE LASER SOURCE A66-32618
- INTERNAL PHASE MODULATION IN HE- NE LASER USING ELECTRO-OPTIC EFFECT IN CRYSTAL QUARTZ, OBSERVING SPECTRUM AND RF MODE BEATS A66-32621
- COHERENT GAS LASER LIGHT TO MEET REQUIREMENTS OF STREAK PHOTOGRAPHY FOR TIME-RESOLVED FLOW VISUALIZATION A66-32959
- POWER ENHANCEMENT IN PULSED HE- NE LASERS, NOTING OVERSHOOTING FOR RF DISCHARGE MODULATION WITH SQUARE WAVE A66-32963
- CARBON DIOXIDE LASER PRINCIPLE AND PERFORMANCE A66-33247
- HIGH-POWER MOLECULAR LASER BASED ON VIBRATIONAL-ROTATIONAL ENERGY LEVEL, NOTING CARBON DIOXIDE-NEON-HELIUM LASER DESIGN A66-33248
- ION LASERS INVOLVING ELECTRON TRANSITIONS IN ATOMS OR MOLECULES WITH LOST ELECTRONS A66-33249
- FREQUENCY STABILIZATION OF GAS LASER BY SERVOMECHANISM AND LAMB DIP METHOD A66-33252
- MICHELSON INTERFEROMETER USED TO STUDY MODES OF RED HE- NE LASER A66-33316
- MEASURING AMPLIFICATION OF COHERENT OPTICAL RADIATION IN NEON-HELIUM FILLED TUBE A66-33512
- COMPETITION OF TRANSITIONS AND EMISSION IN HE- NE LASER, USING RESONATOR WITHOUT DISPERSING PRISM A66-33514
- LASER RADAR RANGING SYSTEM USING PSEUDORANDOM CODE MODULATION, CONSIDERING APPLICATION TO PULSE AND DIGITAL CIRCUITRY, STATISTICAL COMMUNICATION THEORY AND ELECTRO-OPTICAL ENGINEERING A66-33557
- FIRST- AND SECOND-ORDER SIDEBANDS DUE TO STRONG CW SIGNAL INTERMODULATION EFFECT IN 3.39 MU HE- NE LASER A66-33615
- VIBRATIONAL EXCITATION, POPULATION INVERSION AND COUPLING OUT OF CARBON DIOXIDE-NITROGEN-WATER VAPOR LASER A66-33758
- IONIZED NOBLE GAS LASERS, CONSIDERING PROBLEMS AT HIGHER POWERS, ESPECIALLY THOSE OF INVERSION MECHANISM AND MAGNETIC FIELD EFFECTS A66-33767
- ULTRASONIC CELL WHICH MODULATES INTENSITY OF HE- NE LASER BEAM FOR COMMUNICATION OF INTELLIGENCE A66-34059
- NONLINEAR ZEEMAN EFFECT FOR GAS LASER A66-34181
- TRAVELING WAVES INTERACTION IN GAS LASER, EXPLAINING FORCING-OF-OSCILLATIONS AND TRAVELING WAVE SUPPRESSION EFFECT A66-34685
- DECAY CROSS SECTION OF PUMPED METASTABLE HE ATOMS IN HE- NE LASER A66-34695
- NE- HE LASER OUTPUT DEPENDENCE ON PRESSURE AND NONEXCITED ATOM CONCENTRATION A66-34696
- RADIATION FROM HIGH-ENERGY-LEVEL TRANSITIONS EXCITED IN HE- NE LASER DURING OPTICAL PUMPING WITH HE LAMP A66-34697
- HIGH TEMPERATURE FLOW CHARACTERISTICS IN FREE PISTON SHOCK TUBE MEASURED BY MEANS OF PULSED LIGHT OF HE- NE GAS LASER A66-35353
- HELIUM-NEON LASER ASSESSMENT AS SOURCE IN HIGH PRECISION RANGE MEASUREMENTS A66-35362
- GAS LASER OUTPUT AND THRESHOLD IN POPULATION INVERSION FROM PHOTODISSOCIATION OF METHYL IODIDE AND FLUOROIODO METHYLIDYNE A66-35368
- GAS LASER USED TO DETERMINE RESIDUAL WEDGE ANGLE IN OPTICAL FLATS AND DIRECT DISPLAY OF RELIEF MAPS A66-35390
- C W HE- NE LASER MEASUREMENT OF LIGHT SCATTERING IN CRYSTALS NOTING LASER OUTPUT, PERFORMANCE AND CRYSTAL IMPERFECTIONS A66-35402
- ATOMIC TIME STANDARDS, DESCRIBING CESIUM BEAM STANDARD, AMMONIA MASER AND GAS-CELL TYPE CLOCKS A66-35468
- SPATIAL COHERENCE MEASUREMENT OF HE- NE LASER OUTPUT A66-35592
- GAS LASER WITH GENERALIZED POLARIZATION CHARACTERISTICS, NOTING ROLE OF DEGENERATE ATOMIC ENERGY LEVELS A66-36005
- PULSED DISCHARGES OF OCS MOLECULAR LASER A66-36080
- DIPOLE MOMENT CALCULATION FOR GAS LASER IN MAGNETIC FIELD A66-37353
- RELATION BETWEEN LASER PARAMETERS AND CATHODE DIAMETER IN EXCITATION OF HE- NE MIXTURE BY DISCHARGE OF HOLLOW CYLINDER A66-37361

NONRECIPROCAL EFFECTS ASSOCIATED WITH EXCITATION  
CURRENT OBSERVED IN D C-EXCITED HE- NE RING  
LASER, NOTING COUPLING PHENOMENA BETWEEN RIGHT  
AND LEFT WAVES A66-37408

MAGNITUDE OF HANLE EFFECT OF NEON ATOMS EMITTED  
BY LASER DEPENDENCE ON EXCITATION DISCHARGE  
INTENSITY EXPLAINED BY MULTIPLE COHERENT DIFFUSION  
AT METASTABLE LEVEL A66-37409

CONTINUOUS WAVE GAS LASER AS LIGHT SOURCE IN  
SCATTERED LIGHT STATIC PHOTOELASTICITY A66-37443

SPHERICAL COUPLER FOR FASTENING MIRRORS AND PLANE-  
PARALLEL PLATES AT BREWSTER ANGLE IN GAS LASER  
A66-37523

IDENTIFICATION OF NUMBER OF LINES AT 11 MICRONS  
EMITTED FROM PULSED CARBON DIOXIDE LASER AS P  
BRANCH OF CARBON DIOXIDE VIBRATIONAL TRANSITION  
A66-37629

PHASE RELATIONS OF LONGITUDINAL MODES IN GAS LASER  
WITH ANNULAR RESONATOR A66-37663

UPPER LASER STATES DERIVING POPULATION THROUGH  
CASCADE TRANSITIONS FROM HIGHER LAYER STATES OF  
ARGON ION NOTING CONSISTENCY OF LASER OUTPUT  
CURRENT DEPENDENCE WITH CURRENT DEPENDENCE OF  
CASCADE RATE A66-37774

COUPLING BETWEEN OPPOSITELY DIRECTED TRAVELING  
WAVES IN HE- NE RING LASER IN FORM OF MUTUAL  
BACKSCATTERING OF ENERGY FROM EACH BEAM INTO  
DIRECTION OF OTHER A66-37778

DEGRADATION OF CONTINUOUS ARGON LASER PERFORMANCE  
WHEN POSITIONED IN AXIAL MAGNETIC FIELD, NOTING  
ROLE OF QUENCHING, RADIATION TRAPPING AND  
EXCITATION MECHANISMS A66-37779

DISCHARGE CURRENT AND LASER LIGHT NOISE  
MEASUREMENTS EFFECT IN GAS DISCHARGE HELIUM-NEON  
LASER, USING EQUIVALENT CIRCUIT A66-38240

FREQUENCY STABILIZATION OF GAS LASER TO LOCK  
OUTPUT TO CENTER OF ATOMIC RESONANCE, USING ERROR  
SIGNAL A66-38241

PULSED NITROGEN LASER DELIVERING HIGH AVERAGE  
POWER WITHOUT COMPLICATIONS OF CONVENTIONAL Q-  
SWITCHING A66-38266

SPONTANEOUS EMISSION NOISE POWER ADDED TO  
AMPLIFIED SIGNAL IN LASER AMPLIFIER IN HE- XE GAS  
DISCHARGE AND SATURATION RELATION TO POPULATION  
INVERSION A66-38387

LASER MACHINING, DISCUSSING HOLE DRILLING,  
MICROWELDING METAL REMOVAL AND APPLICATION TO HARD  
BRITTLE MATERIALS A66-38484  
ASME PAPER 66-MD-28

SECOND-HARMONIC GENERATION BY FOCUSED LASER BEAMS  
BASED ON EXPERIMENTS USING HE- NE GAS LASER,  
NOTING SHG SHOULD BE STRONGLY PEAKED WHEN FOCUS  
IS AT EITHER OF CRYSTAL SURFACES A66-38554

GENERAL NONEQUILIBRIUM SYSTEM IN CONTACT WITH  
RESERVOIR DESCRIBED VIA CORRELATION FUNCTIONS OF  
QUANTIZED FIELD OPERATORS, NOTING INFLUENCE OF  
CAVITY AND OPTICAL PUMP A66-38633

HYPERFINE SPECTRUM OF XENON IN 3.5 MM MASER  
TRANSITION NOTING EXPERIMENTAL SETUP, GAIN  
PROFILES FOR VARIOUS INPUT POWER LEVELS AND  
STRUCTURAL PROPERTIES A66-38763

SELF-INDUCED DIVERGENCE OF CONTINUOUS WAVE HE- NE  
LASER BEAMS WHEN TRAVERSING TRANSPARENT LIQUID,  
NOTING NONLINEAR EFFECT IN PROPAGATION OF LIGHT  
A66-39164

WAVE SYNCHRONIZATION IN GAS LASER WITH RING  
RESONATOR CAVITY A66-39301

ATOMIC COLLISIONS, EXCITATION TRANSFER PROCESSES  
AND ENERGY LEVEL TRANSITION PROBABILITIES IN  
PLASMA OF GAS LASERS A66-39305

GAS LASER FREQUENCY AND EMITTED POWER DEPENDENCE  
ON RESONATOR TUNING A66-39308

GAS LASER ALIGNMENT, OBTAINING OSCILLATION ON  
THREE LINES OF HE- NE LASER A66-39718

ATOMIC DEGENERACY INFLUENCE ON MODE INTERACTIONS  
IN GAS LASER A66-39930

LIGHT REFLECTION FROM SHOCK WAVES CLARIFIED  
THROUGH PROPAGATION IN SHOCK TUBES, USING GAS  
LASER A66-40012

PULSED COAXIAL TRANSMISSION LINE NITROGEN GAS  
LASER, NOTING PRESSURE EFFECT A66-40107

INTRACAVITY INTERFEROMETER LASER MEASUREMENTS OF  
POWER GAIN AND OUTPUT IN SINGLE-FREQUENCY AR  
LASER AND 6328-ANGSTROM NE ISOTOPE SHIFT A66-40110

LONGITUDINAL MAGNETIC FIELD EFFECT UPON GAS  
DISCHARGE, ZEEMAN EFFECT AND FARADAY EFFECT IN  
HE- NE GAS LASER A66-40586

DEPENDENCE OF EMISSION INTENSITY OF GAS LASER ON  
LONGITUDINAL AND TRANSVERSE MAGNETIC FIELDS, USING  
SIMPLIFIED MODEL A66-41092

PLASMA FLUCTUATION EFFECT ON GAS LASER NOISE,  
NOTING RELATION BETWEEN MODULATION AMPLITUDE OF  
LIGHT OUTPUT AND FREQUENCY NOISE AND OSCILLATION  
SPECTRUM A66-41294

ELECTRON AND NEUTRAL ATOM DENSITIES IN HELIUM AND  
ARGON AFTERGLOW PLASMA OBTAINED BY TWO HELIUM-NEON  
LASER INTERFEROMETERS, NOTING TEMPORAL DEPENDENCE  
OF ELECTRON DECAY A66-41364

PERFORMANCE CHARACTERISTICS FOR PULSE TYPE AR  
LASER WITH EXTERNAL INTERFERENTIAL SYSTEM OF  
QUASI-CONFOCAL SPHERICAL MIRRORS A66-41452

RADIATIVE POWER AMPLIFICATION OF HE- NE LASER  
WITH NEARLY CONFOCAL RESONATORS A66-41453

COMPETITION, HYSTERESIS AND REACTIVE Q-SWITCHING  
IN CARBON DIOXIDE LASERS AT 10.6 MICRONS, USING  
MOVING MIRROR TECHNIQUE A66-41631

RESONATOR MISALIGNMENT EFFECT ON OUTPUT OF NEON-  
HELIUM LASER WITH SPHERICAL MIRRORS A66-41830

MEASURING AMPLIFICATION OF COHERENT OPTICAL  
RADIATION IN NEON-HELIUM FILLED TUBE A66-42125

COMPETITION OF TRANSITIONS AND EMISSION IN HE- NE  
LASER, USING RESONATOR WITHOUT DISPERSING PRISM  
A66-42127

ZEEMAN LASER INTERFEROMETER, USING AXIAL MAGNETIC  
FIELD TO OBTAIN SIMULTANEOUS LEFT- AND RIGHT-HAND  
CIRCULARLY POLARIZED OSCILLATION MODES AT UPPER  
AND LOWER CAVITY RESONANCES A66-42248

CONDUCTIVITY MODULATION BY HEAVY-TO-LIGHT HOLE  
TRANSITIONS IN P-TYPE GERMANIUM NOTING CARRIER  
LIFETIME AND RINGING OF LASER PULSE A66-42249

10.6 MICRON OUTPUT OF CARBON DIOXIDE- HE LASER  
MODULATED, USING BRAGG DIFFRACTION FROM  
LONGITUDINAL ACOUSTIC WAVES IN TE A66-42251

BOOK ON LASERS COVERING OPTICAL CAVITIES, GAS  
LASERS, SOLID STATE LASERS, OPTICAL PUMPING,  
Q-SWITCHING, POPULATION INVERSION, ETC A66-42319

SATURATION INDUCED OPTICAL NONRECIPROCALITY IN

HE- NE RING LASER PLASMA, ELIMINATING FREQUENCY  
LOCKING BY USING FARADAY EFFECT

A66-42552

LASER DOPPLER VELOCIMETER FOR GAS AND LIQUID FLOW  
VELOCITY MEASUREMENT

A66-42557

SCATTERING MATRIX ANALYSIS OF SINGLE FREQUENCY  
MICHELSON TYPE HE- NE GAS LASER, INCLUDING  
FREQUENCY AND AMPLITUDE STABILITY ANALYSIS OF  
OSCILLATION SPECTRUM

A66-42566

GAS-DISCHARGE CW LASERS, PARTICULARLY HE- NE,  
CARBON DIOXIDE, ARGON-ION AND PULSED SELF-  
TERMINATING LASERS, DISCUSSING CLASSIFICATION,  
POWER OUTPUT AND GAIN, DOPPLER WIDTH, COHERENCE  
AND NOISE

A66-42801

PRESSURE- AND GAIN-DEPENDENT FREQUENCY SHIFT  
MEASUREMENTS IN STABILIZED 6328 ANGSTROM HE- NE  
LASER

A66-42803

OPTICAL HETERODYNE RECEIVER ANTENNA PROPERTIES,  
NOTING EFFECTIVE APERTURE OF CAPTURE CROSS SECTION  
VS DIRECTIONAL TOLERANCE AND DETECTION OF DOPPLER  
SHIFTS IN LIQUID SCATTERED COHERENT LIGHT

A66-42809

EFFECT OF LONGITUDINAL MAGNETIC FIELD ON OUTPUT  
POWER OF GAS LASER OPERATING IN IR SPECTRUM,  
NOTING GAS-MIXTURE PRESSURE IN DISCHARGE TUBE

A66-42977

LASER OSCILLATION EFFECT ON CHARACTERISTICS OF  
ELECTRON GAS OF HELIUM-NEON LASER PLASMA STUDIED  
IN TERMS OF WAVE ATTENUATION IN PLASMAGUIDE

A66-43006

BEATING OF OSCILLATING FREQUENCIES CORRESPONDING  
TO TWO DIRECTIONS OF TRAVEL OF ANNULAR CAVITY  
LASER WITH ACTIVE GAS MEDIUM IN MOVEMENT

A66-43007

L F FLUCTUATIONS IN EMISSION OF HE- NE GAS LASER  
MEASURED, USING FABRY- PEROT RESONATOR AND RING-  
TYPE RESONATOR

A66-43084

DETECTION OF SURFACE SCATTERED LIGHT BY LASER  
RADIATION

AFWL-TR-65-220

N66-24735

HELIUM-NEON LASER INTERFEROMETERS TO OBTAIN  
ELECTRON AND NEUTRAL ATOM DENSITIES IN HELIUM  
AND ARGON AFTERGLOW PLASMAS

AROD-4832-7

N66-25866

WATER VAPOR ABSORPTION SPECTRA IN SUBMILLIMETER  
WAVE REGION, ANALOG-TO-DIGITAL CONVERSION AND  
RECORDING SYSTEM, AND CARBON DIOXIDE LASER  
CONSTRUCTION

NASA-CR-74971

N66-26261

SOLID STATE AND GAS LASER DEVELOPMENT - MANGANESE  
AND RARE EARTH COLLISION LASERS, LASER PUMPING  
LASER, PHOTODISSOCIATION LASERS, AND THERMAL  
OPTICAL EFFECTS IN SOLID STATE LASER MEDIA

TRG-034-TR-1

N66-28553

DIRECT CURRENT PUMPING AND COMBINED MICROWAVE  
ELECTRON-CYCLOTRON RESONANCE WITH DIRECT CURRENT  
PUMPING EFFECTS ON DISCHARGE BEHAVIOR AND ARGON  
LASER OPERATION

REPT.-2

N66-29240

GAS LASER STUDIES IN 100 TO 1000 MICRON RANGE

AFOSR-66-0719

N66-29864

MAGNETO-OPTIC OBSERVATIONS WITH GAS LASER, HIGH  
SPEED MAGNETIZATION REVERSAL EQUIPMENT, INFRARED  
ABSORPTION SPECTRA, AND CONTINUOUS SOURCE  
WAVEGUIDE ANTENNA SYNTHESIS

NAVWEPS-8847

N66-30157

MAGNETIC DOMAIN PATTERNS IN THIN FERROMAGNETIC  
FILMS USING 10 MILLIWATT HELIUM-NEON LASER

N66-30158

LASER TECHNOLOGY - MATERIALS, CONTROL, FUNCTIONS,  
DEMODULATION, AND PRACTICAL APPLICATIONS

NASA-TT-F-10201

N66-33688

GEOMETRICAL OPTICS APPROXIMATION SOLUTION TO  
RADIATION POWER OF GAS LASER AS FUNCTION OF  
MIRROR MISALIGNMENT ANGLE

TG-230-T474

N66-34884

GAS LASER AND TELESCOPE TECHNIQUES FOR DEEP SPACE  
OPTICAL COMMUNICATION SYSTEM

NASA-CR-77482

N66-35245

BRILLOUIN SPECTRA OF ACETONE, ETHYL ALCOHOL,  
WATER, CARBON BISULFIDE, TOLUENE, AND CARBON  
TETRACHLORIDE USING HELIUM-NEON LASER AND  
PHOTOELECTRIC DETECTION

N66-35529

DESIGN AND PERFORMANCE OF CW GAS LASER  
TRACKER

N66-36554

OPTIMIZATION OF HIGH-POWER CONTINUOUS-WAVE GAS  
LASER HAVING CARBON DIOXIDE, NITROGEN, AND HELIUM  
MIXTURE AS ACTIVE MEDIUM

S-865

N66-38449

OPTICAL NONLINEARITIES MEASURED BY GAUSSIAN LASER  
BEAM

ML-1405

N66-39487

HIGH CURRENT DISCHARGE EFFECT ON MAGNETICALLY  
CONFINED ARGON LASER

A67-10012

OPTICAL SURFACE ROUGHNESS MEASUREMENT USING  
COHERENT RADIATION PRODUCED BY HELIUM-NEON LASER  
SIGMA-POLARIZED AT 6328 ANGSTROMS

A67-10020

NONLINEAR ATTENUATION OR GAIN CHARACTERISTICS OF  
DOPPLER-BROADENED ATOMIC RESONANCE INVOLVING  
LEVELS WITH SMALL SPLITTINGS, NOTING MODE COUPLING  
OF GAS LASER

A67-10152

FREQUENCY STABILITY OF DOUBLE BEAM AMMONIA LASER  
WITH THERMOSTATIC QUARTZ RESONATORS ON 3-2 LINE

A67-10247

MICROWAVE MODULATION OF HELIUM-NEON LASER  
INTENSITY STUDIED AS FUNCTION OF TEMPERATURE AND  
ELECTRON DENSITY

A67-10260

DECAY CROSS SECTION OF PUMPED METASTABLE HE ATOMS  
IN HE NE LASER

A67-10511

NE- HE LASER OUTPUT DEPENDENCE ON PRESSURE AND  
NONEXCITED ATOM CONCENTRATION

A67-10512

RADIATION FROM HIGH ENERGY LEVEL TRANSITIONS  
EXCITED IN HE- NE LASER DURING OPTICAL PUMPING  
WITH HE LAMP

A67-10513

ELECTRON TEMPERATURE IN ELECTRIC DISCHARGE  
APPLIED TO ARGON ION LASER

A67-10550

INEXPENSIVE CARBON DIOXIDE MOLECULAR GAS LASER  
USING PLANO-CONCAVE EYEGGLASS LENSES

A67-10827

EXTENSOMETER FOR MEASURING SMALL CHANGES OF  
SPECIMEN ON TENSILE TESTING VACUUM FURNACE AT  
HIGH TEMPERATURES, USING CW GAS LASER AS LIGHT  
SOURCE

A67-11036

ELECTRON TEMPERATURE IN ELECTRIC DISCHARGE APPLIED  
TO ARGON ION LASER

A67-11058

LASER EXCITED ELECTRONIC RAMAN SPECTRUM OF  
TRIVALENT EU ION DOPED Y GA GARNET

A67-11084

MAGNETICALLY COMPRESSED PLASMA AS HIGH INTENSITY  
SOURCE OF NEAR UV AND VISIBLE RADIATION  
EXPERIMENTALLY STUDIED IN DYNAMIC PINCH

A67-11880

RADIATIVE TRANSITION PROBABILITIES BETWEEN LASER  
VIBRATIONAL LEVELS OF CARBON DIOXIDE, NOTING  
RELAXATION TIME AND DIPOLE MOMENT

A67-11891

SELF-LOCKING MODES IN ARGON ION LASER, OBSERVING

SUBNANOSECOND PULSATION OF LASER OUTPUT WITH  
WIDEBAND PHOTOMULTIPLIER A67-12503

NITRIC OXIDE MOLECULAR LASER OBTAINED BY  
DISSOCIATION OF N O- CL IN PULSED ELECTRICAL  
DISCHARGE A67-12510

HOLOGRAM COPYING METHOD USING GAS LASER AS LIGHT  
SOURCE A67-12513

CONTINUOUSLY VARIABLE OPTICAL DELAY LINE USING  
ACGUSTIC WAVES TO DIFFRACT AND FREQUENCY SHIFT  
PORTION OF ARGON ION LASER BEAM A67-12517

OPTICAL NONLINEARITIES DUE TO CONDUCTION BAND  
ELECTRONS IN IN AS, IN SB, GA AS AND PB TE  
STUDIED, USING Q-SWITCHED CARBON DIOXIDE LASER  
RADIATION A67-12524

OPTICAL MIXING DUE TO CONDUCTION BAND ELECTRONS IN  
SEMICONDUCTOR A67-12525

REGENERATIVE RADIATION FROM NEON LINE IN HE- NE  
LASER, USING SPHERICAL REFLECTORS IN RESONATOR  
A67-13096

CONTINUOUS HELIUM-NEON LASER USED TO OBTAIN  
SHORT INTENSE LIGHT PULSES AND TO STUDY KINETICS  
OF AUTOPHOTOELECTRONIC EMISSION OF HIGH  
RESISTIVITY SILICON A67-13142

OSCILLATION TYPES FOR GAS-LASER SEMICONCENTRIC  
RESONATOR A67-13286

POPULATION INVERSION OF UPPER LASER LEVEL OF  
CARBON DIOXIDE MOLECULES, NOTING ELECTRON-MOLECULE  
COLLISION AND EFFECT OF NEON ADDITION A67-13297

PARAMETRIC AMPLIFICATION OF FAR IR IN TE CRYSTAL  
PUMPED BY CARBON DIOXIDE LASER A67-13572

COUPLING OF PULSE POWERS IN TEM OF UP TO 80 MW  
FROM HE- NE LASER AT 6328 ANGSTROMS A67-13678

HIGH POWER VISIBLE CW GAS LASER BEAM GENERATION,  
MODULATION AND DEFLECTION FOR APPLICATION TO  
VISUAL DISPLAY TECHNOLOGY  
SMPT PREPRINT 100-6 A67-13801

C W HE- NE LASER COMPARED WITH MERCURY ARC  
SOURCE, OBTAINING RAMAN SPECTRA OF CARBON  
TETRACHLORIDE BY THREE METHODS OF EXCITATION  
A67-13912

PERFORMANCE CHARACTERISTICS FOR PULSE TYPE AR  
LASER WITH EXTERNAL INTERFERENTIAL SYSTEM OF  
QUASI-CONFOCAL SPHERICAL MIRRORS A67-14188

CHARACTERISTICS OF PULSED LASER ACTION IN HE- NE  
AND HE- AR MIXTURES AT PRESSURES ABOVE 200 MM HG  
A67-14189

RADIATIVE POWER AMPLIFICATION OF HE- NE LASER  
WITH NEARLY CONFOCAL RESONATORS A67-14190

EFFECT OF DOPPLER AND IMPACT LINE BROADENING OF  
SPECTRAL CHARACTERISTICS OF GAS LASER, NOTING  
STANDING MONOCHROMATIC WAVE SATURATION A67-14197

TRAVELING WAVES INTERACTION IN GAS LASER,  
EXPLAINING FORCING-OF-OSCILLATIONS AND TRAVELING  
WAVE SUPPRESSION EFFECT A67-14371

SELF-MODULATION CHARACTERISTICS OF CARBON DIOXIDE  
LASER AND USE IN MEASURING DETECTOR RESPONSE AND  
ATMOSPHERIC PROPAGATION CHARACTERISTICS A67-14399

POPULATION INVERSION OF UPPER LASER LEVEL OF  
CARBON DIOXIDE MOLECULES, NOTING ELECTRON-MOLECULE  
COLLISION AND EFFECT OF NEON ADDITION A67-14722

CONSTRUCTION METHODS OF DC OPERATED HE/ NE LASER  
TUBES USING OPTICAL CONTACT BONDS A67-14763

OBLIQUE MODES AND ENERGY OF GAS LASER BEAM  
A67-14913

EMISSION FROM TELLURIUM SINGLE CRYSTAL PUMPED BY  
TWO WAVES FROM CARBON DIOXIDE LASER A67-14914

PHASE AND AMPLITUDE FLUCTUATION OF GAS AND SOLID  
STATE LASERS, ACCOUNTING FOR NOISE CAUSED BY  
PUMPING, INCOHERENT DECAY, LATTICE VIBRATIONS AND  
ATOMIC COLLISIONS A67-14949

LASER ACTION DELAY DUE TO PLASMA-TUBE-SURFACE  
DECOMPOSITION RESULTING FROM BOMBARDMENT BY NEON  
IONS A67-15110

SINGLE MODE OUTPUT POWER MODULATION ANALYSIS OF  
SATURATION AND GAIN OF GAS LASERS AND EFFECTS OF  
EXCITATION DENSITY MODULATION AND RESONATOR Q  
MODULATION A67-15111

MAGNETO-OPTICAL MODULATION OF IR EMISSION OF  
HE- NE GAS LASER A67-15139

GAS LASER SPECTROSCOPIC ANALYSIS OF HYPERFINE  
STRUCTURE, PARAMAGNETIC PROPERTIES, RADIATIVE  
LIFETIMES AND DOPPLER-BROADENED TRANSITION  
SATURATION BEHAVIOR OF EXCITED STATES OF XE 129  
A67-15462

SUM AND DIFFERENCE FREQUENCY MIXING OF VISIBLE AND  
IR GAS LASER LIGHT IN GA P AT NEAR RESTSTRAHL  
FREQUENCIES AND RELATIONSHIP TO SPONTANEOUS RAMAN  
SCATTERING A67-15464

VAPORIZATION OF THIN METALLIC FILMS WITH FOCUSED  
LASER BEAM, COMPARING THEORETICAL AND EXPERIMENTAL  
RESULTS PREPARED BY USING PULSED HIGH PRESSURE  
HELIUM-NEON LASER A67-15478

POLARIZATION OF LIGHT SCATTERED FROM HE- NE LASER  
BEAM, APPLYING QUANTUM THEORY TO FORMULA FOR  
DEPOLARIZATION RATIO A67-15624

INERTIAL SENSORS, DISCUSSING MAGNETIC RESONANCE  
AND SUPERCONDUCTOR GYROSCOPES, RING LASERS, FLUID  
DYNAMICAL DEVICES, ELECTROSTATIC GYROSCOPES, ETC  
A67-16517

FISSION OR RADIOISOTOPIC NUCLEAR RADIATION APPLIED  
TO LASER PUMPING, DISCUSSING FORMS, SOURCES,  
POWER, SOLID STATE AND MOLECULAR GAS LASERS,  
ENERGY TRANSFER, OPTICAL FLUORESCENCE AND CUT-OFF  
PHENOMENON A67-16547

ELECTRON COLLISION RATE AND DENSITY CALCULATIONS  
FOR HE- NE LASER PLASMA A67-16598

TUBE DIAMETER INFLUENCE ON OUTPUT POWER AND  
EFFICIENCY OF GAS LASER A67-16629

TRANSIENT AND STEADY STATE IR EMISSION FROM LOW-  
LYING VIBRATIONAL LEVELS OF CARBON DIOXIDE IN  
LASER SYSTEMS, USING DC DISCHARGE A67-16630

EXCITATION AND RELAXATION MECHANISMS FOR CLOSED  
MOLECULAR GAS LASER A67-16631

GAS LASER PUMPED MICROWAVE EMISSION FOR PRODUCING  
CONTROLLED EXCITED STATE POPULATION FOR RF  
SPECTROSCOPY OF NEON A67-16638

DOPPLER AND IMPACT BROADENING OF SPECTRAL LINES  
AND PRESSURE EFFECTS ON POWER OUTPUT OF GAS LASER  
A67-16643

LAMB SELF-CONSISTENT THEORY AND RATE EQUATION  
APPROXIMATION STUDY OF MAGNETIC DEPOLARIZATION OF  
VAPOR AND POLARIZATION OF MONOMODE GAS LASER IN  
MAGNETIC FIELD A67-16644

DOUBLE RESONANCE EFFECTS EXTENDED TO CASE OF  
STIMULATED EMISSION IN EXCITED STATES OF NEON,  
USING GAS LASER IN TRANSVERSE DC MAGNETIC FIELD

- A67-16645  
INTRACAVITY TIME-VARYING PERTURBATION OF LOSSES IN GAS LASER USING DIAMAGNETIC FARADAY EFFECT IN GLASSES ANALYZED IN CONNECTION WITH OUTPUT INTENSITY A67-16646
- PULSED GAS DISCHARGE LASERS NOTING REQUIRED ENERGY LEVEL FOR MAXIMUM EFFICIENCY, EXPERIMENTAL TECHNIQUES AND RESULTS A67-16650
- ARGON DISCHARGE CHARACTERISTICS USED IN CONTINUOUS ACTION ION LASER FOR ANALYSIS OF INVERSION PRODUCTION MECHANISM A67-16680
- TUNABLE RAMAN LASER OBTAINED BY ELECTRON MOBILITY SUBJECTED TO MAGNETIC FIELD, NOTING THRESHOLD PUMP POWER A67-16684
- SINGLE MODE 6328 ANGSTROM UNITS HE- NE LASER HAVING SINGLE FREQUENCY POWER OUTPUT OF 50 MWATT STABILIZED BY FEEDBACK SYSTEM WHOSE OUTPUT IS NEITHER AMPLITUDE NOR FREQUENCY MODULATED A67-16685
- SINGLE MODE OUTPUT POWER MODULATION STUDY OF SATURATION AND GAIN OF GAS LASER A67-16686
- ENHANCED LASING OF HIGH PRESSURE HE- NE LASER, COMMENTING ON DELAY TIME OF LIGHT PULSE EMITTING THROUGH WALLS OF DISCHARGE TUBE FROM START OF EXCITING PULSE A67-16687
- STIMULATED EMISSION IN TRIPLET SYSTEM OF NITROGEN MOLECULE PRODUCED BY PULSED LASER DISCHARGE, IDENTIFYING LINES AND INTERPRETING INTENSITY DISTRIBUTION IN ROTATIONAL BAND SPECTRUM A67-16785
- ONSET OF OSCILLATION IN HE- NE LASER ANALYZED USING LAMB THEORY, OBTAINING TIME CONSTANT VALUE FOR POPULATION OF LOWER LASER LEVEL A67-16821
- INTERNAL MODULATION OF IR GAS LASER USING CADMIUM SULFIDE OR SELENIDE SINGLE CRYSTALS A67-16914
- AMPLITUDE OF LF OSCILLATIONS IN HE- NE LASER A67-16948
- GASEOUS LASER OUTPUT EXPRESSED IN SINGLE OR TWO-LINE OSCILLATIONS AS FUNCTION OF PUMPING RATES AND TRANSITION PROBABILITIES, CONSIDERING CONCEPT OF EQUIVALENT NETWORK A67-16979
- TRANSIENT BEHAVIOR OF HE- NE LASERS UNDER PULSED HF EXCITATION, DISCUSSING RATE EQUATIONS REPRESENTING ATOMIC POPULATION DENSITY AND PHOTON DENSITY A67-16980
- SPATIALLY RESOLVED HE- NE LASER HETERODYNE MEASUREMENTS OF ELECTRON NUMBER DENSITIES IN WEAKLY IONIZED AR PULSED DISCHARGES A67-17272
- DOUBLE PROBE AND MICROWAVE RESONANCE MEASUREMENTS OF GAS ADDITIVES EFFECT ON RADIAL VARIATION OF ELECTRON TEMPERATURE AND DENSITY WITH PARTIAL PRESSURES IN CARBON DIOXIDE-NITROGEN-HELIUM GAS LASER A67-17274
- SUPPRESSION OF UNDESIRABLE AXIAL MODES IN GAS LASER OSCILLATING AT SEVERAL FREQUENCIES OBTAINED BY FILLING WITH ACTIVE GAS MIXTURE EACH OF TWO COUPLED FABRY- PEROT TYPE RESONATORS A67-17326
- FIZEAU FRINGES PRODUCED IN LASER ILLUMINATED FABRY- PEROT INTERFEROMETER TO OBTAIN CONCENTRATION PROFILES IN TURBULENT AND LAMINAR JETS A67-17371
- INELASTIC SCATTERING OF CARBON DIOXIDE LASER RADIATION BY MOBILE LANDAU-LEVEL ELECTRONS IN N- IN SB A67-17723
- NONLINEAR MEDIUM ANISOTROPY AND SATURATION
- EFFECTS ON ORIENTATION OF POLARIZATION ELLIPSE OF GAS LASER MODE A67-17823
- ELECTRO-OPTIC INTRA-CAVITY COLOR SWITCHING IN KRYPTON ION FABRY- PEROT LASER A67-17888
- HIGH POWER CARBON DIOXIDE LASER HETERODYNE DETECTION OF BEATS AND LINEWIDTH MEASUREMENTS A67-17891
- HE- NE LASER FREQUENCY STABILIZATION USING FOUR AUTOMATIC FREQUENCY CONTROL / AFC/ SYSTEMS A67-17965
- RADIO ELECTRONICS, DISCUSSING QUANTUM ELECTRONICS, LASERS, MICROWAVE DEVICES AND TECHNOLOGY, PLASMA PHYSICS, ETC A67-18072
- GAS LASER BEHAVIOR IN MAGNETIC FIELD, ANALYZING DATA ON MAGNETIC EFFECT, ZEEMAN EFFECT AND MICROWAVE PUMPING A67-18168
- SPHERICAL COUPLER FOR FASTENING MIRRORS AND PLANE-PARALLEL PLATES AT BREWSTER ANGLE IN GAS LASER A67-18394
- POLARIZATION CHARACTERISTICS OF IONIZED ARGON LASER IN MAGNETIC FIELD A67-18542
- OPTICAL MASER OSCILLATION LINES IN HF DISCHARGE IN MIXTURE OF AR AND BR A67-18545
- RESONATOR Q-MODULATION TECHNIQUE OBSERVATION OF CENTRAL DIP TUNING IN MODULATED POWER OUTPUT OF GAS LASER WITH MOVING MIRROR A67-18758
- PRESSURE DEPENDENCE OF OUTPUT POWER OF HE- NE LASER ON AMPLITUDE OF PERIODIC HIGH VOLTAGE EXCITATION PULSES A67-18784
- LASER LINE-SCANNING PHOTOGRAPHIC SYSTEM, DISCUSSING POSSIBLE EXTRATERRESTRIAL APPLICATIONS A67-19011
- LASERS AND RCA A67-19080
- CHARGED PARTICLES FOR LASING, DISCUSSING MANUFACTURE OF ARGON LASER A67-19083
- GAS LASER AS SOURCE OF ILLUMINATION, WITH ATTENTION TO ORIGIN OF AVENTURINE SPOTS ON SCREEN A67-19142
- RATE EQUATIONS FOR GAS DISCHARGE MODULATION OF HE- NE LASER A67-19492
- TUNING OF GAS LASER RESONATOR A67-19505
- RELATIVE INTENSITIES AND CASCADE TRANSITION RATIO IN CW AR II LASER NEAR 4103.9 ANGSTROMS A67-19560
- AXIAL MAGNETIC FIELD EFFECT ON NE- HE LASER POWER OUTPUT OPERATING IN REGIME OF SIMULTANEOUS GENERATION OF 3.39 AND 0.6328 MICRON LINES A67-19601
- TRAVELING WAVE EXCITATION OF HIGH POWER NITROGEN AND NEON LASERS WITH VELOCITY MATCHING THAT OF STIMULATED EMISSION A67-20093
- TIME BEHAVIOR OF PULSED WATER VAPOR LASER, NOTING SPIKING FROM FAR IR EMISSION LINES A67-20095
- PHOTON COUNTING DISTRIBUTIONS AND INTENSITY FLUCTUATIONS OF MODULATED LASER BEAMS A67-20125
- RAMAN GENERATOR FOR AMPLIFICATION OF COHERENT RADIATION, AND SPECTRAL CHARACTERISTICS OF GAS LASER WITH ONE DIRECTION TRAVELING WAVE PROPAGATION FTD-MT-65-399 N67-11313
- MULTIMODALITY OF GAS LASER IN RESONATOR WITH ONE DIRECTION TRAVELING WAVE PROPAGATION N67-11315



- INTERFEROMETRIC TYPE RANGING SYSTEM UTILIZING CW LASER  
NASA-TM-X-55608 N67-11380
- OPTICAL HETERODYNE SYSTEM USED TO MEASURE ELECTRON DENSITY OF PLASMA  
NASA-CR-79511 N67-11738
- TECHNICAL ASPECTS AND USES OF GAS LASERS  
GUO-2177 N67-11969
- HIGH POWER LASER RESEARCH - LASER MATERIAL EVALUATION, STIMULATED OUTPUT AND Q-SWITCHING, SELF-FOCUSING IN LIQUIDS, AND FLASH LAMP SPECTROSCOPY  
NRL-6444 N67-12645
- ION LASER EXPERIMENTS, MOLECULAR NITROGEN LASER, AND GAS LASER THEORY  
N67-12649
- PHASE-LOCKING SCHEME FOR FREQUENCY-STABILIZED GAS LASER OSCILLATORS  
NASA-CR-80958 N67-14893
- HELIUM-NEON LASER USED WITH VARIOUS INTERFEROMETERS TO MEASURE RAPID ELECTRON DENSITY CHANGES IN ARGON PLASMA  
N67-15240
- PLASMA DIAGNOSTICS WITH THREE-MIRROR GAS LASER INTERFEROMETER  
N67-15241
- RESEARCH REPORTS ON PHYSICS OF LASER RADIATION, OPTICAL RADAR SYSTEMS, CORNER REFLECTOR ON LUNAR SURFACE, PHOTON CORRELATIONS AND COUNTING STATISTICS, AND COLD CATHODES FOR GAS LASERS  
NASA-CR-81248 N67-16014
- ALUMINUM COLD CATHODES FOR SINGLE MODE HELIUM NEON GAS LASERS  
N67-16017
- DISCHARGE TUBE DIMENSIONS, FLOW RATE, WALL TEMPERATURE, AND GAS MIXTURES DEFINED FOR CARBON DIOXIDE GAS LASER  
NASA-CR-81332 N67-16633
- AUTOMATIC LASER BEAM DETECTOR AND INSTANTANEOUS TRANSVERSE ELECTROMAGNETIC MODE ANALYSIS OF HELIUM-NEODYMIUM LASER  
N67-16952
- LASER APPLICATIONS WITH INTERFEROMETERS, HOLOGRAPHY, RADIOMETRY, CALORIMETRY, AND NOISE DETECTION  
N67-17362
- ARGON FM LASER, PARAMETRIC OSCILLATOR, AND BACKWARD WAVE OSCILLATOR DEVELOPMENT  
NASA-CR-81730 N67-18019
- DRAG EFFECT OF GAS RING LASER ACTIVE MEDIUM  
NASA-TT-F-10693 N67-18935
- GAS LASER RESEARCH, ATOMIC, MOLECULAR, AND INFRARED SPECTROSCOPY TECHNIQUES, AND INTENSE LASER BEAM INTERACTION WITH MATTER  
AFCRL-66-727 N67-19224
- GAS MASER**  
HYDROGEN ATOM BEAM CHARACTERISTICS, DISCUSSING SIGNAL POWER, GENERATING FREQUENCY, RADIATION SIGNAL DAMPING AND HYDROGEN ATOM RELAXATION TIME  
A66-28289
- VERY FINE-BEAMED MASER OSCILLATION PRODUCED IN ATOMIC HYDROGEN BY HF DISCHARGE OBSERVED BY DOUBLE FOCUSING TECHNIQUE  
A66-42993
- HYDROGEN MASER BEHAVIOR UNDER COHERENT LOW FREQUENCY ZEEMAN TRANSITION EXCITATION  
ECOM-2706 N66-38236
- DUAL CHANNEL TRAVELING WAVE HYDROGEN MASER FOR FREQUENCY GENERATION AND CONTROL  
N66-38555
- AMPLITUDE AND FREQUENCY CHARACTERISTICS OF HYDROGEN-ATOM BEAM MASER  
A67-11574
- MAGNETICALLY TUNABLE IR MASERS OF HELIUM-XENON, CONSIDERING EXPERIMENTAL PROBLEM IN APPLYING
- TUNABLE IR MASER TO IR SPECTROSCOPY  
A67-14764
- MAGNETIC FIELD GRADIENT RELAXATION MECHANISM BY RANDOM EXCITATION OF TRANSITIONS IN F EQUALS 1 LEVEL OF GROUND STATE OF HYDROGEN ATOMS IN MASER  
A67-16635
- OSCILLATION AMPLITUDE MODULATION IN AMMONIA BEAM MASER OSCILLATOR WITH SINGLE CAVITY FOLLOWED BY TWO CAVITIES IN CASCADE  
A67-16636
- COMMUNICATION SYSTEM RESEARCH ON HYDROGEN MASER, SOLID STATE IMAGE CONVERTER, AND TELEMETRY SIGNAL PROPAGATION  
NASA-TM-X-53535 N67-16724
- HYDROGEN MASER POTENTIAL AS STABLE FREQUENCY REFERENCE FOR PRECISION TRACKING SYSTEMS  
N67-16725
- OPTIMAL CONSTRUCTION OF ATOMIC HYDROGEN FREQUENCY STANDARD FOR SPACECRAFT APPLICATION  
NASA-CR-82491 N67-19095
- GAS MIXTURE**  
CHARACTERISTICS OF PULSED LASER ACTION IN HE- NE AND HE- AR MIXTURES AT PRESSURES ABOVE 200 MM HG  
A67-14189
- GAS PHASE**  
LASER ACTION IN ZINC SELENIDE CRYSTALS AT 4600 ANGSTROMS PREPARED UNDER HIGH PRESSURE IN CLOSED CONTAINER BY GAS PHASE REACTION AND FOLLOWING CRYSTALLIZATION  
A67-20183
- GAS PRESSURE**  
PRESSURE- AND GAIN-DEPENDENT FREQUENCY SHIFT MEASUREMENTS IN STABILIZED 6328 ANGSTROM HE- NE LASER  
A66-42803
- GAS SPECTROSCOPY**  
ORGANIC GAS MAGNETICALLY TUNED LASER SPECTROSCOPY, DISCUSSING RESOLUTION, ABSORPTION SPECTRA AND VIBRATIONAL DEACTIVATION  
A66-26197
- VIBRATIONAL-ROTATIONAL LINE STRENGTHS AND WIDTHS IN CARBON DIOXIDE, USING CARBON DIOXIDE-NEON LASER  
A66-27030
- GAS TURBINE**  
PLASMA PROPERTIES USING LASERS AND SPECTROSCOPY - TRANSMISSION DESIGN REQUIREMENTS FOR AIRCRAFT GAS TURBINES  
N66-27060
- GASEOUS IONIZATION**  
GROWTH RATE OF IONIZATION BY ELECTRON IMPACT IN PRESENCE OF LASER BEAM, ELASTIC AND INELASTIC SCATTERING CROSS SECTIONS, FREE-FREE ABSORPTION, EXCITATION AND IONIZATION COEFFICIENTS, BREAKDOWN TIMES AND THRESHOLDS  
A66-26193
- TRANSMISSION OF LUMINOUS FLUX DUE TO IONIZATION OF GASES BY HIGH POWER LASER, MEASURING ENERGY ABSORPTION IN IONIZED ZONE  
A66-36255
- GEODESY**  
DENSITY AND TEMPERATURE OF UPPER ATMOSPHERE, SATELLITE TRACKING, GEODETIC APPLICATIONS AND LONG DISTANCE MEASUREMENTS, USING LASER OUTPUT  
A67-17591
- GEODETIC SATELLITE**  
TOPOCENTRIC DISTANCE OF GEODETIC SATELLITE GEOS-A MEASURED BY LASER TELEMETRY FROM STATION  
A66-30586
- SYSTEMS DESIGN STUDY OF ADVANCED GEODETIC LASER SYSTEM  
AFCRL-66-731 N67-15088
- GEOMETRIC FACTOR**  
OPTIMAL DESIGN OF ELLIPTICAL PUMPING CHAMBERS FROM NUMERICAL CALCULATIONS CONTAINING ALL GEOMETRIC SIZES OF PUMPING LAMPS AND LASER RODS AND REFLECTIVITY OF WALLS  
A67-19490
- GEOMETRICAL OPTICS**  
LASER PUMPING BY INTENSE NOBLE GAS DISCHARGE IN

- ZETA-PINCH GEOMETRY A66-25995
- FAR-FIELD LIGHT EMISSION MODE PATTERN OF GA AS DIODE INJECTION LASERS, DIELECTRIC GRADIENT IN INVERSION LAYER AND REFRACTIVE INDEX IN JUNCTION A66-39743
- LASER BEAMS AND RESONATORS, DISCUSSING BEAM PROPAGATION IN FREE SPACE, GEOMETRICAL OPTICS APPLICATION AND RESONATOR MODES IN VIEW OF APERTURE DIFFRACTION EFFECTS A66-42806
- DISTRIBUTION OF PUMPING RADIATION DENSITY IN TRIHEDRAL PRISM LASER RESONATOR BY GEOMETRICAL OPTICS TG-230-T476 N66-34774
- GEOMETRICAL OPTICS APPROXIMATION SOLUTION TO RADIATION POWER OF GAS LASER AS FUNCTION OF MIRROR MISALIGNMENT ANGLE TG-230-T474 N66-34884
- GERMANIUM**
- MULTIPLE CYCLOTRON RESONANCE ABSORPTION LINES IN DEGENERATE VALENCE BANDS OF GE SEMICONDUCTOR STUDIED WITH FAR IR LASER SUBMILLIMETER SPECTROMETER A66-42545
- LASER BEAM-INDUCED RECRYSTALLIZATION OF AMORPHOUS GE SEMICONDUCTOR THIN FILMS PREPARED BY THERMAL DEPOSITION ON GLASS A67-13839
- GLASS**
- THERMAL OPTICAL BEHAVIOR OF GLASSES AND OTHER POTENTIAL LASER MATERIALS AND THERMAL DISTORTION IN AIR, WATER, BENZINE, ETHANOL AND TOLUENE A66-25996
- DAMAGE THRESHOLDS FOR VARIOUS GLASSES EXPOSED TO LASER PULSES, EMPHASIZING INTERNAL DAMAGE A66-28732
- LOW THRESHOLD NEODYMIUM GLASS LASER OSCILLATOR WITH HIGH REPETITION A66-33325
- OPTICAL SPECTRA OF ULTRASHORT OPTICAL PULSES GENERATED BY MODE-LOCKED GLASS-DOPED NEODYMIUM LASERS, CONSIDERING SATURABLE ABSORBER CELL PLACED PARALLEL TO FABRY-PEROT REFLECTOR A66-39115
- GLASS LASERS, COMPARING GLASS WITH CRYSTALS AS HOSTS FOR LASER IONS, CONSIDERING NEODYMIUM LASER PROPERTIES A66-42800
- LASER ACTION IN TRIPLY ACTIVATED BARIUM CROWN GLASS N66-28515
- HOMOGENIZING METHODS FOR PLATINUM-FREE LASER GLASS, AND MELTING OF HIGH-PURITY LASER GLASS IN ALL-CERAMIC SYSTEM SATR-3 N66-30525
- TIME EVOLUTION OF LASER INDUCED FRACTURES IN GLASS, NOTING CRACK PROPAGATION ACCOMPANIED BY SPARKING A67-12508
- TRIVALENT NEODYMIUM DOPED GLASS LASER WITH INTERNAL IMPERFECTIONS DUE TO OPTICAL PUMPING EXAMINED VIA OPTICAL METALLOGRAPHY, TRANSMISSION ELECTRON MICROSCOPY AND ELECTRON DIFFRACTION TECHNIQUES A67-14927
- LASER EMISSION AT 1.06 MICRONS FROM YTTERBIUM-NEODYMIUM GLASS, NOTING LINEARITY OF ENERGY TRANSFER WITH YB CONCENTRATION A67-16664
- TERMINAL LEVEL LIFETIME AND FLUORESCENCE LINE OF NEODYMIUM DOPED GLASS INFLUENCE ON DYNAMICS AND EFFICIENCY OF Q-SPOILED LASER A67-16675
- SATURATED ABSORPTION OF COLOR CENTERS IN GLASS SELF-Q-SWITCHED PULSES, AS IN GLASS CODOPED WITH URANYL OXIDE AND ND IONS A67-16678
- DAMAGE IN GLASS INDUCED BY LINEAR ABSORPTION OF LASER RADIATION NON-Q-SPOILED A67-16794
- NEODYMIUM DOPED OPTICAL GLASSES FOR LASER TECHNOLOGY A67-16855
- MICRO- AND MACROCRACK FORMATION IN ORGANIC GLASS BY FOCUSING OF LASER BEAM A67-18808
- ENERGY TRANSFER IN ACTIVATED GLASSES AND HIGH POWER LASER EMISSION N67-12646
- COMPARISON OF NEODYMIUM DOPED HIGH ENERGY LASER GLASS MATERIAL TO STANDARD SILICATE BASED GLASS AD-640097 N67-16363
- GLOW DISCHARGE**
- C W IR LASER OSCILLATION IN ATOMIC CL IN H CL AND HI GAS DISCHARGES, NOTING USE OF TWO POWER SUPPLIES AND ENERGY LEVEL DIAGRAM A66-28880
- GRAIN BOUNDARY**
- ETCHING METHODS TO VISUALIZE LATTICE DISLOCATIONS AND GRAIN BOUNDARIES IN CZOCHRALSKI GROWN CALCIUM TUNGSTATE CRYSTALS DOPED WITH NEODYMIUM FOR LASER APPLICATION A67-19565
- GRAVITATIONAL POTENTIAL**
- ATOMIC MASER CLOCKS ROTATION WITH EARTH, DERIVING FORMULA FOR RELATIVE DRIFT AT WIDELY SEPARATED LOCALITIES ARISING FROM LOCAL GRAVITATIONAL POTENTIALS A66-30187
- GROUND STATE**
- DEPOPULATION OF GROUND STATE CHROMIUM IONS IN RUBY UNDER OPTICAL PUMPING EXPLAINED VIA RATE EQUATIONS A66-25188
- ABSOLUTE DIRECT EXCITATION CROSS SECTION FROM NEUTRAL GROUND STATE FOR UPPER LEVELS OF TRANSITION IN ARGON LASER A67-12520
- MAGNETIC FIELD GRADIENT RELAXATION MECHANISM BY RANDOM EXCITATION OF TRANSITIONS IN F EQUALS 1 LEVEL OF GROUND STATE OF HYDROGEN ATOMS IN MASER A67-16635
- GROUND STATION**
- HELIUM COOLING SYSTEM FOR SOLID STATE MASER AMPLIFIER INSTALLATION AT COMMUNICATION SATELLITE GROUND STATION N67-12314
- GROUND SUPPORT EQUIPMENT**
- PROGRAM PLANNING, GROUND SUPPORT AND AIRBORNE EQUIPMENT FOR LASER SPACE COMMUNICATION SYSTEM NASA-CR-78855 N66-39446
- GUINEA PIG**
- EFFECTS OF LASER ON GUINEA PIG COCHLEAR FUNCTION A66-82132
- GUNN EFFECT**
- OPTICAL MODULATION IN BULK GALLIUM ARSENIDE, USING GUNN EFFECT A66-33606
- GUNNERY TRAINING**
- AIRBORNE LASER DRIVEN WEAPON SIMULATOR NAVTRADEVEN-1867-1 N66-35051
- GYROSCOPE**
- MATHEMATICAL DEVELOPMENT OF RESONANT FREQUENCIES OF ELECTROMAGNETIC CAVITY - EVALUATION OF OPTICAL MASER PHOTON RATE GYROSCOPE NASA-CR-59809 N66-33411
- LASER SYSTEM FOR DYNAMICALLY BALANCING GYRO ROTORS AND STATICALLY BALANCING ACCELEROMETERS NASA-CR-82449 N67-19130
- H**
- HAMILTONIAN**
- MASER MATERIAL IRON DOPED RUTILE, EXAMINING THEORETICAL AND EXPERIMENTAL DISAGREEMENT IN SPIN HAMILTONIAN DESCRIBING PARAMAGNETIC BEHAVIOR A66-29027
- HARDENING**
- LASER BEAM EFFECT ON HARDENING OF STEEL A66-31802

## HARMONIC EXCITATION

SECOND-HARMONIC ENHANCEMENT IN NONLINEAR CRYSTAL  
BY LOSS MODULATOR COUPLING OF PULSED RUBY LASER  
MODES A66-31939

## HARMONIC GENERATION

SECOND HARMONIC GENERATED BY TRANSMITTING LASER  
RADIATION THROUGH TELLURIUM MONOCRYSTAL, WHILE  
FILTERING OUT FUNDAMENTAL FREQUENCY A66-25437

SECOND HARMONIC GENERATION OF LIGHT ANALYZED,  
STRESSING SATURATION EFFECTS OCCURRING AT HIGH  
LASER POWER, SOLVING NONLINEAR MAXWELL EQUATIONS  
A66-26144

NONLINEAR SUSCEPTIBILITY DESCRIBING SECOND  
HARMONIC GENERATION OF LIGHT MEASURED IN  
SEMICONDUCTORS WITH ZINC-BLENDE SYMMETRY, USING  
QUANTUM MECHANICS AND LASER WAVELENGTH A66-26149

SECOND HARMONIC GENERATION BY Q-SWITCHED LASER  
PULSE FROM SILICON AND GERMANIUM SURFACES  
A66-26150

ELECTRON DENSITY IN LASER-INDUCED SPARK IN AIR  
DETERMINED, MEASURING SIMULTANEOUSLY FUNDAMENTAL  
LASER WAVELENGTH AND SECOND HARMONIC A66-28685

SECOND HARMONIC GENERATION / SHG/ BY FOCUSED LASER  
BEAMS IN NONLINEAR CRYSTALS A66-29816

OPTICAL HARMONIC GENERATION IN IR IN ZINC BLENDE,  
HEXAGONAL AND TRIGONAL CRYSTALS, USING UNFOCUSED  
CARBON DIOXIDE LASER IN CW AND Q-SWITCHED  
OPERATION A66-30182

SECOND HARMONIC GENERATION BY LASER BEAMS OF  
FINITE SPECTRAL WIDTH, USING QUANTUM TRANSITIONS  
AND KINETIC EQUATIONS, NOTING SHAPE OF PUMPING  
LINE AT FUNDAMENTAL FREQUENCY A66-30845

STATISTICAL EFFECTS DURING GENERATION OF SECOND  
HARMONIC IN OPTICALLY TRANSPARENT CRYSTALS, NOTING  
COEFFICIENT OF CORRELATION BETWEEN HARMONIC AND  
FUNDAMENTAL RADIATION POWER OF SOLID STATE LASER  
A66-31167

FREQUENCY DOUBLING IN RESONANCE LASER, OBTAINING  
SECOND HARMONIC FIELD FOR LASER RADIATION BY GIANT  
PULSES A66-37144

SECOND HARMONIC FREQUENCY GENERATION OBTAINED IN  
PROCESS OF OPTICAL MIXING OF COLLINEAR NEODYMIUM  
LASER BEAMS IN POTASSIUM DIHYDROGEN PHOSPHATE  
A66-37550

SECOND-HARMONIC GENERATION BY FOCUSED LASER BEAMS  
BASED ON EXPERIMENTS USING HE- NE GAS LASER,  
NOTING SHG SHOULD BE STRONGLY PEAKED WHEN FOCUS  
IS AT EITHER OF CRYSTAL SURFACES A66-38554

CONSISTENT THEORY OF NONLINEAR OPTICAL EFFECTS IN  
BOUNDED LIGHT BEAMS BY EXTENDING PARABOLIC  
EQUATIONS TO NONLINEAR PROBLEMS A66-41095

INTENSE PULSE GENERATION AT 5300 ANGSTROMS BY  
FREQUENCY DOUBLING IN Q-SWITCHED AND GLASS LASER  
AND POSSIBILITY OF GENERATING PARTICULAR HARMONICS  
A67-10759

STATISTICAL EFFECTS DURING GENERATION OF SECOND  
HARMONIC IN OPTICALLY TRANSPARENT CRYSTALS, NOTING  
COEFFICIENT OF CORRELATION BETWEEN HARMONIC AND  
FUNDAMENTAL RADIATION POWER OF SOLID STATE LASER  
A67-12928

PICOSECOND LASER PULSE WIDTHS MEASUREMENT BY  
METHOD USING SPECIAL SYMMETRY PROPERTIES OF SECOND  
HARMONIC GENERATION AT GA AS CRYSTAL SURFACE  
A67-20097

## HARMONIC OSCILLATION

I R MASER ACTION ON VIBRATIONAL TRANSITIONS OF  
THERMALLY PUMPED POLYATOMIC MOLECULES

A66-26203

## HARTREE-FOCK CALCULATION

ABSOLUTE DIRECT EXCITATION CROSS SECTION FROM  
NEUTRAL GROUND STATE FOR UPPER LEVELS OF  
TRANSITION IN ARGON LASER A67-12520

## HAZARD

CEREBRAL CORTEX OF DOG AS AFFECTED BY LASER  
RADIATION A66-82035

## HEAT CAPACITY

RUBY LASER AS ENERGY SOURCE FOR MEASURING  
THERMOPHYSICAL PROPERTIES OF MATERIALS VIA FLASH  
TECHNIQUE A67-15305

## HEAT EXCHANGER

RECIRCULATION OF LIQUID THROUGH CELL AND EXTERNAL  
HEAT EXCHANGER TO SOLVE PROBLEM OF REPEATED  
FLASHING IN EUROPIUM CHELATE LASERS A66-39108

## HEAT FLOW

ONE-DIMENSIONAL HEAT FLOW EQUATION FOR LIQUID  
NITROGEN END-COOLED RUBY LASER ROD A66-38386

## HEAT SHIELD

DETECTION OF SURFACE SCATTERED LIGHT BY LASER  
RADIATION  
AFWL-TR-65-220 N66-24735

## HEAT SOURCE

VOLUME DENSITY OF HEAT SOURCES IN RUBY LASER ROD  
BY NUMERICAL INTEGRATION OF PUMPING AND ABSORPTION  
SPECTRA A67-13117

## HEAT TRANSFER

HEATING PROCESS IN LASER WELDING OF METAL SHEETS,  
TAKING INTO ACCOUNT ENERGY DISTRIBUTION, HEAT  
TRANSFER AND FLUX DENSITIES A66-29989

HEAT TRANSFER AND STRESS WAVE EVOLUTION PRIOR TO  
ABLATION AND THERMAL EQUILIBRIUM IN EXPOSURE OF  
SOLID AND LIQUID MATERIALS TO LASER SOURCES  
A66-32638

## HEAT TREATMENT

SURFACE TEMPERATURE DETERMINATION PROCEDURE FOR  
LASER HEATED METALS BASED ON HEAT CONDUCTION  
EQUATIONS AND ION EMISSION FROM SURFACE A66-29035

RECIRCULATION OF LIQUID THROUGH CELL AND EXTERNAL  
HEAT EXCHANGER TO SOLVE PROBLEM OF REPEATED  
FLASHING IN EUROPIUM CHELATE LASERS A66-39108

## HELIUM

OUTPUT POWER OF 6328 ANGSTROM HE- NE GAS LASER AS  
FUNCTION OF LASER GAIN, CAVITY LOSS AND OUTPUT  
COUPLING A66-25651

HELIUM-NEON GAS LASER USED TO DETERMINE ELECTRON  
DENSITY VARIATION, SPATIAL AND TEMPORAL, IN  
AFTERGLOW OF Z-PINCH IN H AT 100 MTORR A66-26239

HIGH-POWER MOLECULAR LASER BASED ON VIBRATIONAL-  
ROTATIONAL ENERGY LEVEL, NOTING CARBON DIOXIDE-  
NEON-HELIUM LASER DESIGN A66-33248

MEASURING AMPLIFICATION OF COHERENT OPTICAL  
RADIATION IN NEON-HELIUM FILLED TUBE A66-33512

NONRECIPROCAL EFFECTS ASSOCIATED WITH EXCITATION  
CURRENT OBSERVED IN D C-EXCITED HE- NE RING  
LASER, NOTING COUPLING PHENOMENA BETWEEN RIGHT  
AND LEFT WAVES A66-37408

MEASURING AMPLIFICATION OF COHERENT OPTICAL  
RADIATION IN NEON-HELIUM FILLED TUBE A66-42125

PROPERTIES OF FM AND SUPER-MODE HELIUM-NEON  
LASERS, AND ABSOLUTE FREQUENCY STABILIZATION OF  
FM LASER  
IER-4 N66-35096

- OPTIMIZATION OF HIGH-POWER CONTINUOUS-WAVE GAS LASER HAVING CARBON DIOXIDE, NITROGEN, AND HELIUM MIXTURE AS ACTIVE MEDIUM  
S-865 N66-38449
- MICROWAVE MODULATION OF HELIUM-NEON LASER INTENSITY STUDIED AS FUNCTION OF TEMPERATURE AND ELECTRON DENSITY A67-10260
- COUPLING OF PULSE POWERS IN TEM OF UP TO 80 MW FROM HE- NE LASER AT 6328 ANGSTROMS A67-13678
- CONSTRUCTION METHODS OF DC OPERATED HE/ NE LASER TUBES USING OPTICAL CONTACT BONDS A67-14763
- MAGNETICALLY TUNABLE IR MASERS OF HELIUM-XENON, CONSIDERING EXPERIMENTAL PROBLEM IN APPLYING TUNABLE IR MASER TO IR SPECTROSCOPY A67-14764
- AUTOMATIC LASER BEAM DETECTOR AND INSTANTANEOUS TRANSVERSE ELECTROMAGNETIC MODE ANALYSIS OF HELIUM-NEODYMIUM LASER N67-16952
- HELIUM AFTERGLOW**  
HELIUM-NEON LASER AFTERGLOW AND METASTABLE HELIUM ATOMS UNDER LONG PULSE EXCITATION A66-27335
- ELECTRON AND NEUTRAL ATOM DENSITIES IN HELIUM AND ARGON AFTERGLOW PLASMA OBTAINED BY TWO HELIUM-NEON LASER INTERFEROMETERS, NOTING TEMPORAL DEPENDENCE OF ELECTRON DECAY A66-41364
- HELIUM PLASMA**  
HELIUM-NEON LASER EMISSION ON 6401 ANGSTROM LINE, NOTING INTENSITY VS MIRROR SHIFT AND OPTICAL CAVITY INSTABILITY A66-26336
- SATURATION INDUCED OPTICAL NONRECIPROCITY IN HE- NE RING LASER PLASMA, ELIMINATING FREQUENCY LOCKING BY USING FARADAY EFFECT A66-42552
- HELIUM-NEON LASER INTERFEROMETERS TO OBTAIN ELECTRON AND NEUTRAL ATOM DENSITIES IN HELIUM AND ARGON AFTERGLOW PLASMAS A66-4832-7 N66-25866
- HIGH PRESSURE OXYGEN**  
RUBY LASER INDUCED BREAKDOWN IN OXYGEN GAS AT HIGH PRESSURE N66-35531
- HIGH SPEED CAMERA**  
CRYSTAL MOTION EFFECT ON TIME BEHAVIOR OF LASER GENERATION MODE, USING HIGH SPEED PHOTOGRAPHY AND OSCILLOGRAMS A66-29725
- HIGH SPEED STROBOSCOPIC PHOTOGRAPHY USING KERR CELL MODULATED LASER SOURCE A66-30828
- MULTIPURPOSE ULTRAHIGH SPEED CAMERA SYSTEM, NOTING USE AS MONOSECOND KERR CELL, IMAGE CONVERTER AND GIANT LASER PULSE GENERATOR A66-41675
- LASER LIGHT SOURCE CONTROLLED BY KERR CELL COUPLED WITH Z-TYPE SCHLIEREN OPTICAL SYSTEM TO PRODUCE MULTIPLE FLASH PHOTOGRAPHS OF DETONATION WAVE DEVELOPMENT A67-12227
- HIGH TEMPERATURE FLUID**  
HIGH TEMPERATURE FLOW CHARACTERISTICS IN FREE PISTON SHOCK TUBE MEASURED BY MEANS OF PULSED LIGHT OF HE- NE GAS LASER A66-35353
- HIGH TEMPERATURE PLASMA**  
LASER RADIATION TO DETERMINE ELECTRON DENSITY IN DENSE HIGH TEMPERATURE PLASMA A66-27507
- HIGH TEMPERATURE PLASMAS PRODUCED BY LASER HEATING TID-22132 N66-25340
- HIGH TEMPERATURE SINGLE SOLID PARTICLE PLASMA GENERATION BY FOCUSED GIANT PULSE Q-SPOILED RUBY LASER BEAM IRRADIATION OF LI H SUSPENDED IN VACUUM ELECTRIC FIELDS A67-14047
- LASER MEASUREMENT OF ELECTRON DENSITY IN DENSE, HIGH TEMPERATURE PLASMA N67-13686
- HIGH TEMPERATURE PLASMAS PRODUCED BY Q-SWITCHED LASER BEAM FOCUSED ON ALUMINUM TARGETS TID-22928 N67-13974
- HIGH TEMPERATURE RESEARCH**  
HIGH-TEMPERATURE RESEARCH WITH INFRARED MASER FOR TIME-SPACE RESOLVED DIAGNOSTICS OF DEUTERIUM PLASMAS ARL-65-270 N66-30302
- HOLE MOBILITY**  
CONDUCTIVITY MODULATION BY HEAVY-TO-LIGHT HOLE TRANSITIONS IN P-TYPE GERMANIUM NOTING CARRIER LIFETIME AND RINGING OF LASER PULSE A66-42249
- HOLMIUM**  
COHERENT EMISSION FROM TRIVALENT HOLMIUM IONS IN RARE EARTH SUBSTITUTED YTTRIUM ALUMINUM GARNET, NOTING THREE ENERGY TRANSFER COMBINATIONS IN YAG A66-28690
- C W LASER ACTION IN HOLMIUM-DOPED ERBIUM TRIOXIDE WITH DOMINANT PUMPING BY ENERGY TRANSFER BETWEEN IONS A66-42555
- HOLOGRAPHY**  
HOLOGRAMS AND WAVEFRONT RECONSTRUCTION TECHNIQUES INVOLVING PRISMATIC REFRACTION OF MONOCHROMATIC AND COHERENT LASER LIGHT CAUSING INTERFERENCE PATTERN ON PHOTOGRAPHIC EMULSION A66-25144
- PHOTOGRAPHIC COPIES OF HOLOGRAMS TAKEN WITH LASER LIGHT NOTING FILM, LIGHT SOURCE, DIRECTIONAL EFFECT, PROCESSING, ETC A66-26000
- READOUT TECHNIQUE FOR LASER FOG DISCROMETER A66-33346
- HOLOGRAPHY PRINCIPLES AND DEVELOPMENT, CONSIDERING WAVE FRONT RECONSTRUCTION, LIPPMANN PHOTOGRAPHY, LASER LIGHT, APPLICATION TO TV, ETC A66-35244
- HOLOGRAPHY PRINCIPLES, DISCUSSING BASIC EQUATION, FOURIER TRANSFORM HOLOGRAMS AND HOLOGRAM INTERFEROMETRY A66-36929
- LASER BIBLIOGRAPHY JULY- DECEMBER 1965, INCLUDING REFERENCES TO HOLOGRAMS A66-39541
- PULSED LASER HOLOGRAPH AND PROBLEM OF OVERCOMING LIMITED COHERENCE A66-42560
- COMPRESSIBLE AND INCOMPRESSIBLE FLOWS MADE VISIBLE BY OPTICAL METHOD SENSITIVE TO DENSITY VARIATIONS, SHADOWGRAPH, SCHLIEREN SYSTEM, MACH- ZEHNDER INTERFEROMETER AND HOLOGRAPHIC INTERFEROMETRY WITH LASERS A66-43196
- RESEARCH PROGRAMS ON HOLOGRAPHY, INFRARED LASER, DIGITAL FILTER, ANTENNA TRACKING ACCURACY, PCM TELEMETRY, OPTICAL TRACKING CONTROL SYSTEM NASA-TM-X-55504 N66-31154
- FOURIER TRANSFORM HOLOGRAPHY FOR DIFFUSION OF COHERENT LASER LIGHT BEAM, EXAMINING DISTORTION TERM IN RECONSTRUCTED IMAGE A67-11063
- HOLOGRAM PROCESS FOR OBJECT REFLECTING OR DIFFUSING QUASI-MONOCHROMATIC LIGHT, INCLUDING EFFECTS OF PARTIAL SPATIAL COHERENCE A67-11079
- HOLOGRAM COPYING METHOD USING GAS LASER AS LIGHT SOURCE A67-12513
- OBJECT-IMAGE RELATIONSHIPS IN SCATTERED LASER LIGHT A67-16792
- HOLOGRAPHIC STUDY OF SECOND HARMONIC WAVE EMITTED BY RUBY LASER, EXAMINING INFLUENCE OF DEFECTS OF SPATIAL COHERENCE OF WAVE A67-17322
- BIBLIOGRAPHY ON LASERS COVERING MODES, SCATTERING

- MECHANISMS, QUANTUM ELECTRODYNAMICS, MATTER-  
RADIATION INTERACTION, PLASMA, HOLOGRAPHY AND  
OPTICS A67-17890
- LASER HOLOGRAPHY, DISCUSSING VARIOUS METHODS OF  
WAVE FRONT RECONSTRUCTION A67-19092
- THREE-DIMENSIONAL HOLOGRAPHY  
NEL-1403 N67-16644
- HOLOGRAPHIC METHODS, AND APPLICATIONS BASED ON  
LASERS AS COHERENT LIGHT SOURCE N67-17791
- HOLOGRAM MEASUREMENTS OF OPTICALLY INHOMOGENEOUS  
FIELD BY PULSED LASER NASA-CR-82463 N67-19271
- HOMODYNE  
COHERENT HOMODYNE DETECTION AT 10.6 MICROMETERS  
WITH ALUMINUM-DOPED SILICON PHOTOCONDUCTOR,  
PRESENTING NOISE SPECTRA AND VOLTAGE A67-13989
- LINE WIDTH OF CW GA-AS LASERS MEASURED USING  
HOMODYNE DETECTION AND AUTOCORRELATION A67-16670
- HUMAN TOLERANCE  
EFFECTS OF RUBY LASER RADIATION ON OCULAR TISSUE  
OF RABBITS AND ESTIMATION OF HUMAN CORNEAL  
THRESHOLD FA-R-1815 N67-10968
- HYDROCARBON  
APPARATUS FOR GENERATION OF INFRARED AND FAR  
INFRARED NEW LASER LINES NASA-CR-80090 N67-12260
- HYDROGEN  
HELIUM-NEON GAS LASER USED TO DETERMINE ELECTRON  
DENSITY VARIATION, SPATIAL AND TEMPORAL, IN  
AFTERGLOW OF Z-PINCH IN H AT 100 MTORR A66-26239
- PASCHEN SERIES LASER LINES IN ATOMIC AND  
MOLECULAR HYDROGEN A66-40892
- FREQUENCY STABILITY DETERMINATION FOR HYDROGEN  
MASERS N66-38554
- HYDROGEN ATOM  
HYDROGEN ATOM BEAM CHARACTERISTICS, DISCUSSING  
SIGNAL POWER, GENERATING FREQUENCY, RADIATION  
SIGNAL DAMPING AND HYDROGEN ATOM RELAXATION TIME  
A66-28289
- VERY FINE-BEAMED MASER OSCILLATION PRODUCED IN  
ATOMIC HYDROGEN BY HF DISCHARGE OBSERVED BY  
DOUBLE FOCUSING TECHNIQUE A66-42993
- AMPLITUDE AND FREQUENCY CHARACTERISTICS OF  
HYDROGEN-ATOM BEAM MASER A67-11574
- MAGNETIC FIELD GRADIENT RELAXATION MECHANISM  
BY RANDOM EXCITATION OF TRANSITIONS IN F  
EQUALS 1 LEVEL OF GROUND STATE OF HYDROGEN  
ATOMS IN MASER A67-16635
- HYDROGEN MASER POTENTIAL AS STABLE FREQUENCY  
REFERENCE FOR PRECISION TRACKING SYSTEMS N67-16725
- OPTIMAL CONSTRUCTION OF ATOMIC HYDROGEN FREQUENCY  
STANDARD FOR SPACECRAFT APPLICATION NASA-CR-82491 N67-19095
- HYDROGEN CYANIDE  
THERMALLY EXCITED INFRARED BEAM LASER USING  
CARBON DIOXIDE, NITROGEN OXIDE, AND HYDROCYANIC  
ACID MOLECULAR ENERGY LEVELS ATD-66-102 N67-15769
- HYDROGEN PLASMA  
AEROSPACE TECHNOLOGY RESEARCH IN U.S.S.R. -  
LASER ACTION BY SUPERCOOLED PLASMA, LITHIUM  
CRYSTAL GROWTH, METALLOSTILOXANE POLYMER SYNTHESIS  
AND SPACE TECHNOLOGY CINEMATOGRAPHY N66-32699
- LASER ACTION BY RAPID ELECTRON COOLING OF IONIZED  
DENSE HYDROGEN PLASMA N66-32700
- ELECTRON RECOMBINATION IN LASER PRODUCED HYDROGEN  
DISCHARGE, NOTING TEMPERATURE DECAY DUE TO  
RADIATION, EXPANSION COOLING AND ELECTRON LOSS  
A67-15109
- HYDROXYL  
STIMULATED EMISSION PROCESSES INTERPRETING ON  
MICROWAVE EMISSION FROM POINTS IN SKY, USING  
ANISOTROPIC UV RADIATION WHICH LEADS TO  
MOLECULE ALIGNMENT AND POPULATION INVERSION  
A66-37343
- HYPERFINE STRUCTURE  
HYPERFINE SPECTRUM OF XENON IN 3.5 MM MASER  
TRANSITION NOTING EXPERIMENTAL SETUP, GAIN  
PROFILES FOR VARIOUS INPUT POWER LEVELS AND  
STRUCTURAL PROPERTIES A66-38763
- GAS LASER SPECTROSCOPIC ANALYSIS OF HYPERFINE  
STRUCTURE, PARAMAGNETIC PROPERTIES, RADIATIVE  
LIFETIMES AND DOPPLER-BROADENED TRANSITION  
SATURATION BEHAVIOR OF EXCITED STATES OF Xe 129  
A67-15462
- HYPERVELOCITY IMPACT  
HYPERVELOCITY IMPACT TESTS ON ALUMINUM TARGET  
PLATES TO EVALUATE MICROMETEOROID IMPACT  
SENSORS - LASER SIMULATION STUDY NASA-CR-76102 N66-30173
- HYSTERESIS  
HYSTERESIS PHENOMENA IN He-Ne GAS LASER IN AXIAL  
MAGNETIC FIELD AND POLARIZATION OF OSCILLATING  
MODE WITHIN CERTAIN TUNING REGION A66-29385
- TUNING OF AMMONIA BEAM MASER RESONATOR BASED ON  
FREQUENCY SHIFT METHOD, NOTING HYSTERESIS  
APPEARANCE AND ELIMINATION A66-31696
- QUENCHING AND HYSTERESIS EFFECTS BETWEEN ZEEMAN  
OSCILLATIONS ON SINGLE AXIAL MODE OBSERVED IN  
NEAR-ZERO MAGNETIC FIELDS FOR SHORT PLANAR LASER  
A66-39116
- COMPETITION, HYSTERESIS AND REACTIVE Q-SWITCHING  
IN CARBON DIOXIDE LASERS AT 10.6 MICRONS, USING  
MOVING MIRROR TECHNIQUE A66-41631
- ICE  
CLEAVAGE AND SEPARATION OF DYE-DOPED ICE AND  
PARAFFIN INSTANTANEOUSLY HEATED BY LASER PULSE,  
MEASURING MECHANICAL PULSE AT ENERGY  
CONCENTRATIONS BELOW VAPORIZATION HEAT A67-18807
- ILLUMINANCE  
GATED LASER NIGHT-VIEWING SYSTEM, CALCULATING  
APPARENT ILLUMINANCE AS FUNCTION OF TARGET  
DISTANCE A66-36938
- ILLUMINATION  
GAS LASER AS SOURCE OF ILLUMINATION, WITH  
ATTENTION TO ORIGIN OF AVENTURINE SPOTS ON SCREEN  
A67-19142
- IMAGE CONVERTER  
MULTIPURPOSE ULTRAHIGH SPEED CAMERA SYSTEM, NOTING  
USE AS MONOSECOND KERR CELL, IMAGE CONVERTER AND  
GIANT LASER PULSE GENERATOR A66-41675
- COMMUNICATION SYSTEM RESEARCH ON HYDROGEN MASER,  
SOLID STATE IMAGE CONVERTER, AND TELEMETRY  
SIGNAL PROPAGATION NASA-TM-X-53535 N67-16724
- IMAGE TUBE  
PHOTOGRAPHIC RADAR SYSTEM EMPLOYING Q-SWITCHED  
RUBY LASER, MULLARD TYPE 6929 IMAGE TUBE AND  
CONVENTIONAL CAMERA A66-38796
- IMAGING TECHNIQUE  
WRITING RATE OF ROTATING-MIRROR STREAK CAMERA  
DETERMINED, USING Q-SWITCHED LASER TECHNIQUE

- A66-30419  
HOLOGRAPHY PRINCIPLES, DISCUSSING BASIC EQUATION,  
FOURIER TRANSFORM HOLOGRAMS AND HOLOGRAM  
INTERFEROMETRY A66-36929  
WIDE FIELD ACTIVE IMAGING, IMAGE PROCESSING IN  
WHICH PICTORIAL INFORMATION IS PLACED WITHIN LASER  
CAVITY A66-42559  
HOLOGRAM PROCESS FOR OBJECT REFLECTING OR  
DIFFUSING QUASI-MONOCROMATIC LIGHT, INCLUDING  
EFFECTS OF PARTIAL SPATIAL COHERENCE A67-11079  
HOLOGRAPHIC METHODS, AND APPLICATIONS BASED ON  
LASERS AS COHERENT LIGHT SOURCE A67-17791
- IMPACT**  
DOPPLER AND IMPACT BROADENING OF SPECTRAL LINES  
AND PRESSURE EFFECTS ON POWER OUTPUT OF GAS LASER  
A67-16643
- IMPACT TEST**  
HYPERVELOCITY IMPACT TESTS ON ALUMINUM TARGET  
PLATES TO EVALUATE MICROMETEOROID IMPACT  
SENSORS - LASER SIMULATION STUDY  
NASA-CR-76102 A66-30173
- IMPLOSION**  
IMPLOSION OF FAST NONPREIONIZED THETA PINCH  
STUDIED, USING FIRST AND SECOND HARMONIC OF RUBY  
LASER LIGHT A66-37638
- IMPURITY**  
LASER MODE OPERATION IN PRESSURE OF RADIATION  
ABSORBING IMPURITY ANALYZED BY EXTENDED THOMSON  
TYPE SYSTEM A66-31558  
IMPURITY CONCENTRATION EFFECT ON MAXIMUM  
CONTINUOUS WAVE POWER FROM GALLIUM ARSENIDE LASERS  
AT 77 DEGREES K A66-37782  
SOLID STATE MASER OSCILLATOR OPERATING IN ZERO  
FIELD CONFIGURATION, USING FERRIC ION SUBSTITUTED  
AS IMPURITY IN ALUMINUM NITRATE HOST CRYSTAL  
A66-42551  
CRYSTALLINE SOLID LASERS, CONSIDERING RARE EARTH  
AND TRANSITION METAL IMPURITIES AND HOST  
MATERIALS, NOTING CW LASER CHARACTERISTICS  
A66-42799  
LASER TYPE REGIME OF SEMICONDUCTOR HAVING  
RADIATION INDUCED BY IMPURITY BAND TRANSITIONS OF  
CURRENT CARRIERS A67-13137
- INCLINATION**  
RUBY LASER OPERATION WITH INCLINED MIRRORS  
A67-17170
- INCOHERENT SCATTERING**  
NONLINEAR INCOHERENT SCATTERING OF LASER BEAM FROM  
PLASMA R66SD40 A66-36016
- INCOMPRESSIBLE FLOW**  
COMPRESSIBLE AND INCOMPRESSIBLE FLOWS MADE VISIBLE  
BY OPTICAL METHOD SENSITIVE TO DENSITY VARIATIONS,  
SHADOWGRAPH, SCHLIEREN SYSTEM, MACH- ZEHNDER  
INTERFEROMETER AND HOLOGRAPHIC INTERFEROMETRY WITH  
LASERS A66-43196
- INDIUM ANTIMONIDE**  
SEMICONDUCTOR BULK INJECTION LASER COMPARED TO  
JUNCTION LASERS, NOTING IN SB NPP STRUCTURES  
A66-25556  
STIMULATED EMISSION FROM ELECTRON BEAM EXCITATION  
OF TELLURIUM AND PURE AND N-TYPE DOPED INDIUM  
ANTIMONIDE IN SEMICONDUCTOR LASERS A66-26179  
PHOTOLUMINESCENCE AND STIMULATED EMISSION OF  
GALLIUM ARSENIDE AND INDIUM ANTIMONIDE OBTAINED BY  
OPTICAL PUMPING, NOTING EFFECT OF APPLIED MAGNETIC  
FIELD ON LASER AND DIODE EMISSIONS A66-26182
- INDIUM ARSENIC ANTIMONIDE SINGLE CRYSTALS IN P-N  
JUNCTION LASER A66-31767  
COHERENT RADIATION GENERATION IN ELECTRON-HOLE  
INDIUM ANTIMONIDE PLASMA, DISCUSSING EMISSION  
SPECTRUM A66-40319  
FORMATION OF MAGNETIC PINCH IN ELECTRON-HOLE  
PLASMA IN IN SB AND POSSIBILITY OF POPULATION  
INVERSION IN PINCH DI-82-0502 A66-29169  
INDIUM ARSENIC ANTIMONIDE SINGLE CRYSTALS IN P-N  
JUNCTION LASER A67-10087  
SPONTANEOUS AND INDUCED COHERENT RADIATION FROM  
INDIUM ANTIMONIDE ELECTRON-HOLE PLASMA A67-10088  
SEMICONDUCTOR LASERS AND FAST IR DETECTORS,  
DISCUSSING IN AS, IN SB AND THREE TYPES OF  
MERCURY CADMIUM TELLURIDE DETECTORS A67-16668  
INELASTIC SCATTERING OF CARBON DIOXIDE LASER  
RADIATION BY MOBILE LANDAU-LEVEL ELECTRONS IN N-  
IN SB A67-17723
- INDIUM ARSENIDE**  
IN AS LASER EMISSION, DISCUSSING RADIATIVE  
TRANSITIONS, COHERENT EMISSION FROM IN AS DIODES,  
RECOMBINATION MECHANISMS IN IR RADIATION SPECTRA,  
ETC A66-25065  
OPTICAL EXCITATION IN INDIUM ARSENIDE AND GALLIUM  
ANTIMONIDE YIELDING LASER RADIATION A66-25438  
COHERENT EMISSION OF INDIUM ARSENIDE PHOSPHIDE P-N  
JUNCTION A66-31788  
INDIUM ARSENIDE LASERS AND HG TE- CD TE  
PHOTODETECTORS WITH VERY FAST TIME CONSTANTS FOR  
IR SPECTRAL BAND A66-36268  
COHERENT EMISSION OF INDIUM ARSENIDE PHOSPHIDE P-N  
JUNCTION A67-10101  
SEMICONDUCTOR LASERS AND FAST IR DETECTORS,  
DISCUSSING IN AS, IN SB AND THREE TYPES OF  
MERCURY CADMIUM TELLURIDE DETECTORS A67-16668  
INDIUM ARSENIDE DIODE LASER FABRICATION USING  
LIQUID PHASE EPITAXY, NOTING QUANTUM EFFICIENCY  
A67-17096
- INDIUM PHOSPHIDE**  
INDIUM PHOSPHIDE BASED SEMICONDUCTOR LASER  
AMPLIFICATION, LOSS FACTOR AND RADIATION PATTERN  
A67-10065
- INELASTIC SCATTERING**  
INELASTIC SCATTERING OF CARBON DIOXIDE LASER  
RADIATION BY MOBILE LANDAU-LEVEL ELECTRONS IN N-  
IN SB A67-17723
- INERTIAL GUIDANCE**  
INERTIAL SENSORS, DISCUSSING MAGNETIC RESONANCE  
AND SUPERCONDUCTOR GYROSCOPES, RING LASERS, FLUID  
DYNAMICAL DEVICES, ELECTROSTATIC GYROSCOPES, ETC  
A67-16517
- INERTIAL NAVIGATION**  
RING LASER INERTIAL SENSOR FOR AEROSPACE SYSTEMS  
OBTAINING HIGH ACCURACY ANGULAR RESOLUTION AND  
MECHANICAL SIMPLICITY A67-15665
- INFORMATION PROCESSING**  
COHERENT OPTICAL TRANSDUCER FOR OPTICAL  
INFORMATION PROCESSING A66-31244
- INFORMATION RETRIEVAL**  
EXTREMELY WIDEBAND INFORMATION STORAGE AND  
RETRIEVAL SYSTEMS EMPLOYING LASER OR ELECTRON  
BEAM ON SILVER HALIDE OR ELECTRON BEAM ON  
THERMOPLASTIC FILM A67-11437

## INFORMATION THEORY

INFORMATION THEORY AND THERMODYNAMICS OF MASERS  
FTD-TT-65-899/1628364 N66-29196

## INFRARED DETECTOR

INDIUM ARSENIDE LASERS AND HG TE- CD TE  
PHOTODETECTORS WITH VERY FAST TIME CONSTANTS FOR  
IR SPECTRAL BAND A66-36268

GAS LASER ALIGNMENT, OBTAINING OSCILLATION ON  
THREE LINES OF HE- NE LASER A66-39718

COHERENT HOMODYNE DETECTION AT 10.6 MICROMETERS  
WITH ALUMINUM-DOPED SILICON PHOTOCONDUCTOR,  
PRESENTING NOISE SPECTRA AND VOLTAGE A67-13989

SEMICONDUCTOR LASERS AND FAST IR DETECTORS,  
DISCUSSING IN AS, IN SB AND THREE TYPES OF  
MERCURY CADMIUM TELLURIDE DETECTORS A67-16668

## INFRARED INSTRUMENT

REPLACING HEATED TUNGSTEN FILAMENT AND IR FILTER  
BY GA AS ELECTROLUMINESCENT DIODE WITHOUT FILTER  
FOR IR ILLUMINATION A66-36266

## INFRARED MASER

NONEQUILIBRIUM POPULATION BUILDUP AND DETECTION  
FOR IR SOLID STATE LASERS AND I R-OPTICAL  
DOUBLE RESONANCE IN LANTHANUM CHLORIDE CRYSTAL  
A66-26177

FAR- IR LASER MOLECULAR SPECTROSCOPY INCLUDING IR  
LASER OSCILLATORS, PHOTON NOISE, DETECTORS AND  
NUCLEAR OPTICS A66-26195

OPTICAL- AND I R-MASER SPECTROSCOPY OF  
INHOMOGENEOUSLY BROADENED RESONANCES, USING GAS  
LASERS A66-26196

I R MASER ACTION ON VIBRATIONAL TRANSITIONS OF  
THERMALLY PUMPED POLYATOMIC MOLECULES A66-26203

I R AND VISIBLE HELIUM-NEON LASER MODULATION USING  
FARADAY ROTATION IN YIG A66-26881

ISOTOPE SHIFTS AND FERMI RESONANCE ROLE IN CARBON  
DIOXIDE IR LASER A66-30176

GALLIUM ARSENIDE DIODE LASER AS PULSED IR SOURCE  
FOR EXPERIMENT AND DESIGN CONSIDERATIONS FOR RADAR  
INDICATION OF CLOUD HEIGHT AND VISIBILITY A66-33616

GA AS CRYSTAL AS ELECTRO-OPTIC MODULATOR AT 10.6  
MICRONS DUE TO SMALL CARRIER ABSORPTION, FREEDOM  
FROM INTERBAND TRANSITIONS AND HIGH RESISTIVITY  
A66-42553

I R GA AS LASER AMPLIFIER WITH GAINS AS HIGH AS  
2000, OUTPUT POWERS OF 150 MW AND SATURATION  
OCCURRING WITH CURRENT INCREASE AT LOW LIGHT  
LEVELS A66-42562

HIGH-TEMPERATURE RESEARCH WITH INFRARED MASER FOR  
TIME-SPACE RESOLVED DIAGNOSTICS OF DEUTERIUM  
PLASMAS ARL-65-270 N66-30302

MAGNETICALLY TUNABLE IR MASERS OF HELIUM-XENON,  
CONSIDERING EXPERIMENTAL PROBLEM IN APPLYING  
TUNABLE IR MASER TO IR SPECTROSCOPY A67-14764

HIGH RESOLUTION SPECTROSCOPY USING ZEEMAN-TUNED  
IR MASER OSCILLATING AT TRANSITIONS BETWEEN 3 AND  
9 MICRONS A67-16633

ISOTOPE SUBSTITUTION EFFECT ON NATURAL FREQUENCIES  
OF VIBRATIONAL-ROTATIONAL TRANSITIONS IN DIATOMIC  
AND TRIATOMIC MOLECULES AND GENERATION OF NEW IR  
MASER FREQUENCIES A67-16634

INTERNAL MODULATION OF IR GAS LASER USING  
CADMIUM SULFIDE OR SELENIDE SINGLE CRYSTALS  
A67-16914

## INFRARED RADIATION

I R LASER RADIATION WITH POWER OF 5.7 WATTS IN  
VICINITY OF 10.69 MU IN SEALED TUBE CONTAINING  
PURE CARBON DIOXIDE EXCITED BY AC OR DC CURRENT  
A66-25410

FAR IR RADIATION DETECTED AT VISIBLE FREQUENCY,  
USING NONLINEAR OPTICAL MIXING WITH LASERS A66-33322

GAS LASER STUDIES IN 100 TO 1000 MICRON RANGE  
AFOSR-66-0719 N66-29864

NITROGEN-CARBON DIOXIDE 10.6 MICRON LASER FOR  
OPTICAL TRACKING SYSTEM N66-31161

SUM AND DIFFERENCE FREQUENCY MIXING OF VISIBLE AND  
IR GAS LASER LIGHT IN GA P AT NEAR RESTSTRAHL  
FREQUENCIES AND RELATIONSHIP TO SPONTANEOUS RAMAN  
SCATTERING A67-15464

TRANSIENT AND STEADY STATE IR EMISSION FROM LOW-  
LYING VIBRATIONAL LEVELS OF CARBON DIOXIDE IN  
LASER SYSTEMS, USING DC DISCHARGE A67-16630

THERMALLY EXCITED INFRARED BEAM LASER USING  
CARBON DIOXIDE, NITROGEN OXIDE, AND HYDROCYANIC  
ACID MOLECULAR ENERGY LEVELS ATD-66-102 N67-15769

## INFRARED SPECTROSCOPY

SPECTROSCOPY OF IR EMISSION AND LASER OSCILLATION  
RESULTING FROM TRANSIENT POPULATION INVERSIONS ON  
ELECTRONIC TRANSITIONS IN MOLECULAR NITROGEN  
A66-42550

OPTICAL PHENOMENA IN LIQUID AND GASEOUS MEDIA  
AD-626808 N66-35526

MAGNETICALLY TUNABLE IR MASERS OF HELIUM-XENON,  
CONSIDERING EXPERIMENTAL PROBLEM IN APPLYING  
TUNABLE IR MASER TO IR SPECTROSCOPY A67-14764

HIGH RESOLUTION SPECTROSCOPY USING ZEEMAN-TUNED  
IR MASER OSCILLATING AT TRANSITIONS BETWEEN 3 AND  
9 MICRONS A67-16633

GAS LASER RESEARCH, ATOMIC, MOLECULAR, AND  
INFRARED SPECTROSCOPY TECHNIQUES, AND INTENSE  
LASER BEAM INTERACTION WITH MATTER AFCRL-66-727 N67-19224

## INFRARED SPECTRUM

IN AS LASER EMISSION, DISCUSSING RADIATIVE  
TRANSITIONS, COHERENT EMISSION FROM IN AS DIODES,  
RECOMBINATION MECHANISMS IN IR RADIATION SPECTRA,  
ETC A66-25065

EFFECT OF LONGITUDINAL MAGNETIC FIELD ON OUTPUT  
POWER OF GAS LASER OPERATING IN IR SPECTRUM,  
NOTING GAS-MIXTURE PRESSURE IN DISCHARGE TUBE ROLE  
A66-27156

LASER OSCILLATOR STUDY OF COHERENT STIMULATED  
EMISSION OF IR TRANSITIONS IN RARE GASES A66-27336

OPTICAL HARMONIC GENERATION IN IR IN ZINC BLENDE,  
HEXAGONAL AND TRIGONAL CRYSTALS, USING UNFOCUSED  
CARBON DIOXIDE LASER IN CW AND Q-SWITCHED  
OPERATION A66-30182

LOW NOISE PHOTODIODES WITH AVALANCHE  
MULTIPLICATION FOR HIGH SENSITIVITY, NOTING  
CAPABILITY FOR LOW INTENSITY WIDEBAND SIGNAL  
DETECTION, PERFORMANCE IN IR REGION, ETC A66-31934

HIGH FREQUENCY-STABILITY EM WAVE SOURCE, APPLYING  
THERMAL EXCITATION METHODS TO PENCIL QUANTUM  
GENERATOR IN IR REGION A66-39336

HIGH FREQUENCY-STABILITY EM WAVE SOURCE, APPLYING  
THERMAL EXCITATION METHODS TO PENCIL QUANTUM  
GENERATOR IN IR REGION A66-39706

EFFECT OF LONGITUDINAL MAGNETIC FIELD ON OUTPUT

POWER OF GAS LASER OPERATING IN IR SPECTRUM,  
NOTING GAS-MIXTURE PRESSURE IN DISCHARGE TUBE  
A66-42977

MAGNETO-OPTIC OBSERVATIONS WITH GAS LASER, HIGH  
SPEED MAGNETIZATION REVERSAL EQUIPMENT, INFRARED  
ABSORPTION SPECTRA, AND CONTINUOUS SOURCE  
WAVEGUIDE ANTENNA SYNTHESIS  
NAVWEPS-8847 N66-30157

FLASHLIGHT /INCOHERENT/ PUMPING OF VISIBLE AND  
IR, IN SB AND CD S- CD SE LASERS  
A67-10447

**INJURY**

CHORIORETINAL LESION PRODUCED BY PULSED RUBY LASER  
BEAM AND COMPLEX CHANGES IN RETINAL EXCITABILITY  
IN CATS A66-31761

LASER LESIONS-CHANGES IN RETINAL EXCITABILITY IN  
CATS A66-81614

TISSUE DESTRUCTION BY LASER RADIATION, ITS  
MANAGEMENT AND PREVENTIVE MEASURES  
A66-81926

RETINAL LESIONS PRODUCED BY RUBY LASER IN RABBITS  
AND HUMANS A66-82224

**INSTRUMENT ERROR**

NARROW LASER BEAM POINTING TECHNIQUE IN DEEP  
SPACE-TO-EARTH DATA TRANSMISSION FOR REDUCTION IN  
ERROR SOURCES A66-40496

**INSTRUMENT PACKAGE**

LOW NOISE RECEIVERS - TRAVELING WAVE MASER  
DEVELOPMENT N67-15913

**INTERFERENCE**

COHERENCE IN RADIATION PEAKS OF RUBY LASER STUDIED  
THROUGH INTERFERENCE FIELD A66-33510

COHERENCE IN RADIATION PEAKS OF RUBY LASER STUDIED  
THROUGH INTERFERENCE FIELD A66-42124

INTERFERENCES BETWEEN WAVES DIFFRACTED BY CIRCULAR  
SCREENS OR THIN WIRES AND COHERENT BACKGROUND  
PROVIDED BY LASER, PRODUCING RINGS OR RECTILINEAR  
FRINGES A67-10231

INTERFERENTIAL METHOD OF TESTING HIGH RESOLUTION  
PHOTOGRAPHIC EMULSIONS, USING LASER AS LIGHT  
SOURCE A67-10832

OPTICAL PATHS AND VARIABLE-CONTRAST INTERFERENCE  
AT MICHELSON INTERFEROMETER WHICH ADDS TWO GROUPS  
OF TWO LASER COHERENT WAVES A67-17636

TRANSLUCENT AND OPAQUE PHOTOCATHODES ANALYSIS  
A67-19408

INTERFERENCE MEASUREMENT OF HOMOGENEITY OF RUBY  
RESONATOR FOR LASER  
FTD-TT-66-44 N67-11161

**INTERFERENCE MONOCHROMATIZATION**

DEGREE OF COHERENCE OF TWO POINTS ILLUMINATED BY  
PLANE QUASI-MONOCHROMATIC SOURCE  
A67-17574

**INTERFEROMETER**

DEPENDENCE OF ZEEMAN BEAT FREQUENCY ON  
INTERFEROMETER TUNING IN SINGLE-MODE HE- NE LASER  
WITH VARIOUS GAS PRESSURES AND MAGNETIC FIELD  
STRENGTHS A66-26201

LATERAL SHEARING INTERFEROMETER WITH GAS-LASER  
LIGHT SOURCE FOR TESTING LARGE OPTICAL SYSTEMS  
A66-27320

ELECTROSTATIC PROBE MEASUREMENTS OF VELOCITY  
DISPLACEMENT AND ELECTRON DENSITY OF PLASMA USING  
LASER COMPARED WITH MEASUREMENTS USING MICROWAVE  
INTERFEROMETER A66-28269

OPTICAL BEAM DEFLECTION TECHNIQUE USING  
INTERFEROMETER CAVITY ILLUMINATED BY GAS LASER  
BEAM A66-28689

GAS LASER OUTPUT WAVELENGTH STABILIZATION BY USE  
OF EXTERNAL PASSIVE OPTICAL INTERFEROMETER  
A66-28835

PLASMA DENSITY USING LASER BASED INTERFEROMETER,  
INTERPRETING PHASE SHIFT OF LASER SIGNAL AS TIME  
DEPENDENT LASER FREQUENCY VARIATION  
A66-35817

ELECTRON AND NEUTRAL ATOM DENSITIES IN HELIUM AND  
ARGON AFTERGLOW PLASMA OBTAINED BY TWO HELIUM-NEON  
LASER INTERFEROMETERS, NOTING TEMPORAL DEPENDENCE  
OF ELECTRON DECAY A66-41364

PLASMA PHYSICS STUDIES - LASER INTERFEROMETER TO  
MEASURE STRAIN RATE AT KERN RIVER FAULT, PLASMA  
DIFFUSION, ALFVEN WAVES IN RELATIVISTIC WAVES,  
AND PLASMA RADIATION FROM SILVER FOILS  
N66-36419

MAXIMUM OUTPUT POWER FROM RUBY LASER AS FUNCTION  
OF PUMPING FOR SEVERAL INTERFEROMETER BASE  
VALUES  
TG-230-T479 N66-37072

SAGNAC EFFECT - INTERFEROMETER OR RING LASER FOR  
ELECTROMAGNETIC SENSING OF ABSOLUTE ROTATION  
AFCRL-66-311 N66-39733

THREE-MIRROR LASER INTERFEROMETER MEASURING  
ELECTRON DENSITIES IN REPETITIVELY PULSED PLASMAS  
A67-11875

TWYMAN- GREEN ARRANGEMENT OF INTERFEROMETER WITH  
NARROW LASER BEAM AND TWIN PHOTOMULTIPLIERS,  
EXAMINING STRONG SHOCKS IN ARGON IN 15.2 CM SHOCK  
TUBE A67-12688

CONSTRUCTION METHODS OF DC OPERATED HE/ NE LASER  
TUBES USING OPTICAL CONTACT BONDS  
A67-14763

INTERFEROMETER DESIGN FOR USE WITH LASER LIGHT IN  
FLUID MECHANICS A67-15455

COHERENCE AND FLUCTUATIONS OF LIGHT INCLUDING  
STELLAR CORRELATION INTERFEROMETRY, PHOTON  
BUNCHING, ETC A67-17569

HELIUM-NEON LASER USED WITH VARIGUS  
INTERFEROMETERS TO MEASURE RAPID ELECTRON  
DENSITY CHANGES IN ARGON PLASMA  
N67-15240

PLASMA DIAGNOSTICS WITH THREE-MIRROR GAS LASER  
INTERFEROMETER N67-15241

**INTERFEROMETER SYSTEM**

INTRACAVITY INTERFEROMETER LASER MEASUREMENTS OF  
POWER GAIN AND OUTPUT IN SINGLE-FREQUENCY AR  
LASER AND 6328-ANGSTROM NE ISOTOPE SHIFT  
A66-40110

LASER INDUCED PLASMA DENSITY MEASUREMENT USING  
MULTIPLE BEAM INTERFEROMETRY A66-41630

ZEEMAN LASER INTERFEROMETER, USING AXIAL MAGNETIC  
FIELD TO OBTAIN SIMULTANEOUS LEFT- AND RIGHT-HAND  
CIRCULARLY POLARIZED OSCILLATION MODES AT UPPER  
AND LOWER CAVITY RESONANCES A66-42248

LASER STUDIES AT RCA VICTOR RESEARCH  
LABORATORIES, MONTREAL, DISCUSSING  
SPECTROSCOPIC, INTERFEROMETRIC AND PLASMA  
DIAGNOSTIC RESEARCH A67-19082

**INTERFEROMETRY**

OPTICAL LENGTH VARIATIONS IN LASER AMPLIFIERS  
DETERMINED DURING PUMPING AND AMPLIFICATION, USING  
INTERFEROMETRY A66-25999

OPTICAL SYSTEM FOR SCHLIEREN RECORDING, DEFLECTION  
MAPPING, SHADOWGRAPHY AND INTERFEROMETRY ACHIEVED  
FOR LASER LIGHT, USED IN RECORDING OF REFRACTIVE  
INDEX FIELDS A66-26307

LASER BEAM TECHNIQUES FOR STUDY OF PLASMAS WITH  
HIGH ELECTRON DENSITIES A66-26822



- TWO-BEAM INTERFEROMETRY IN COHERENCE THEORY  
A66-26965
- ELECTRON DENSITY IN LASER-INDUCED SPARK IN AIR  
DETERMINED, MEASURING SIMULTANEOUSLY FUNDAMENTAL  
LASER WAVELENGTH AND SECOND HARMONIC  
A66-28685
- TEMPERATURE SHIFT OF RUBY LASER EMISSION MEASURED  
INTERFEROMETRICALLY FOR TEMPERATURES BETWEEN 66  
AND 210 DEGREES K  
A66-28701
- GAS LASERS FOR INTERFEROMETRIC MEASUREMENTS OF  
LENGTHS, NOTING METHODS THAT STABILIZE WAVELENGTHS  
OF LASERS  
A66-31697
- OPTICAL COHERENCE FUNCTIONS AND PROPERTIES FROM  
STATISTICAL VIEWPOINT FOR APPLICATION TO  
SPECTROSCOPY AND STELLAR INTERFEROMETRY  
A66-31987
- QUALITATIVE RESULTS ON TRANSPORT MECHANISMS  
AROUND DROPPING MERCURY ELECTRODE, USING LONG PATH  
LASER INTERFEROMETRY  
A66-33924
- LINE WIDTH OF WELL-STABILIZED LASER OPERATING FAR  
ABOVE THRESHOLD DETERMINED BY PHASE RANDOM  
FLUCTUATION, USING INTERFEROMETER  
A66-39394
- HELIUM-NEON LASER INTERFEROMETERS TO OBTAIN  
ELECTRON AND NEUTRAL ATOM DENSITIES IN HELIUM  
AND ARGON AFTERGLOW PLASMAS  
AROD-4832-7  
N66-25866
- BEAM SCATTERING, INTERFEROMETRY, AND NONLINEAR GAS  
EFFECT STUDIES IN GASEOUS MATTER-LASER BEAM  
INTERACTION EXPERIMENTS  
REPT.-662  
N66-37871
- OPTICAL METHODS AND EQUIPMENT USED IN CHECKING  
SURFACE FINISH AND VOLUME AND SURFACE  
INHOMOGENEITIES OF ACTIVE MEDIA AND  
INTERFEROMETRIC MIRRORS OF LASERS  
A67-13143
- LASERS USED TO EXTEND RF PLASMA DIAGNOSTIC  
PROCEDURES TO OPTICAL FREQUENCIES BY  
INTERFEROMETRIC AND THOMSON DIFFUSION METHODS  
A67-13474
- INTERFEROMETRIC TYPE RANGING SYSTEM UTILIZING CW  
LASER  
NASA-TM-X-55608  
N67-11380
- INTERFEROMETRIC PHOTOGRAPHIC TECHNIQUES FOR  
RECORDING OPTICAL PATH LENGTH VARIATIONS IN  
PUMPED LASER RODS  
ECOM-2751  
N67-14331
- INTERMODULATION  
FIRST- AND SECOND-ORDER SIDEBANDS DUE TO STRONG  
CW SIGNAL INTERMODULATION EFFECT IN 3.39 MU HE-  
NE LASER  
A66-33615
- INTERPLANETARY DUST  
SYSTEMS ANALYSES AND MODELS OF LASER TECHNIQUES  
DESIGNED TO DETECT INTERPLANETARY DUST IN  
ATMOSPHERE OF EARTH  
NASA-CR-80473  
N67-13108
- INTERSTELLAR MICROWAVE SPECTRUM  
MASER AMPLIFIER BASED ON UV CONTINUUM PUMPING  
FROM NEARBY STARS, EXPLAINING 18-CM OH EMISSION  
FROM ANOMALOUS H-2 REGIONS  
A66-43042
- INTERSTELLAR RADIATION  
STIMULATED EMISSION PROCESSES INTERPRETING OH  
MICROWAVE EMISSION FROM POINTS IN SKY, USING  
ANISOTROPIC UV RADIATION WHICH LEADS TO  
MOLECULE ALIGNMENT AND POPULATION INVERSION  
A66-37343
- INTERSTELLAR TRAVEL  
INTERSTELLAR VEHICLE PROPELLED BY TERRESTRIAL  
LASER BEAM  
A66-35488
- IODATE  
GAS LASER OUTPUT AND THRESHOLD IN POPULATION
- INVERSION FROM PHOTODISSOCIATION OF METHYL IODIDE  
AND FLUOROiodo METHYLIDYNE  
A66-35368
- IODINE  
TRANSITIONS OF FIRST TWO BAND SYSTEMS OF IODINE  
EXCITED IN ARGON SUITABLE FOR LASER ACTION  
A66-42085
- PHOTODETACHMENT PROBABILITY FOR CS AND NEGATIVE  
I DUE TO SIMULTANEOUS ABSORPTION OF TWO RUBY  
QUANTA  
A67-16627
- ION  
ULTRAVIOLET RADIATION FOR RUBY LASER PUMPING, AND  
ENERGY TRANSFER PROCESSES BETWEEN ELECTRON  
ORBITS AND BETWEEN UNLIKE IONS  
ML-1393  
N66-24104
- ION BOMBARDMENT  
DOPING OF SEMICONDUCTORS BY ION BOMBARDMENT -  
MACHINING BY LASER BEAM - OSCILLATIONS AND  
CIRCUIT BEHAVIOR OF GUNN DIODES  
N66-35029
- LASER ACTION DELAY DUE TO PLASMA-TUBE-SURFACE  
DECOMPOSITION RESULTING FROM BOMBARDMENT BY NEON  
IONS  
A67-15110
- ION CURRENT  
ION CURRENT PRODUCED BY ILLUMINATING MATERIALS  
WITH FOCUSED OUTPUT OF PULSED RUBY LASER  
NASA-CR-54154  
N66-28382
- ION EMISSION  
ENERGY SPECTRA OF IONS EMITTED BY BERYLLIUM,  
CARBON AND MOLYBDENUM HEATED BY LASER  
A66-25479
- SURFACE TEMPERATURE DETERMINATION PROCEDURE FOR  
LASER HEATED METALS BASED ON HEAT CONDUCTION  
EQUATIONS AND ION EMISSION FROM SURFACE  
A66-29035
- ACTUAL LINE SHAPE EXPECTED FROM ACCELERATING  
RADIATING ION, ERRORS DUE TO LORENTZIAN  
APPROXIMATION AND RESULTS FOR ION LASER TRANSITION  
IN RARE GAS LASERS  
A66-30181
- ELECTRON-ION EMISSION PATTERN DISTRIBUTION  
OBTAINED BY PULSED LASER FOCUSING ON SOLID TARGET  
A66-33256
- ENERGIES OF IONS GENERATED FROM METAL SURFACE  
IRRADIATED BY SINGLE GIANT PULSE LASER  
A66-38412
- POSITIVE ION EMISSION FROM TUNGSTEN SURFACES LASER  
IRRADIATED STUDIED, USING TIME-OF-FLIGHT  
SPECTROMETER  
A67-16651
- ION INJECTION  
RESEARCH ON PLASMA STABILITY, BEAM INTERACTIONS,  
AND ELECTRIC BREAKDOWN OF GAS BY LASER  
EUR-CEA-FC-352  
N67-14307
- ION MOTION  
DEPOPULATION OF GROUND STATE CHROMIUM IONS IN RUBY  
UNDER OPTICAL PUMPING EXPLAINED VIA RATE EQUATIONS  
A66-25188
- KINETIC ENERGIES OF IONS PRODUCED BY GIANT LASER  
PULSES, NOTING DEPENDENCE OF MEAN SQUARE ION  
VELOCITY ON PULSE PEAK INTENSITY  
A67-15099
- ION SOURCE  
LASER VAPORIZATION AND IONIZATION OF SOLID  
MATERIALS TO OBTAIN IONS FOR TIME-OF-FLIGHT MASS  
SPECTROMETER  
A66-39385
- IONIC COLLISION  
THRESHOLD DATA FOR RUBY AND NEODYMIUM LASER  
PULSE-INDUCED BREAKDOWN IN Xe, Ar, Kr, Ne,  
He, OXYGEN, NITROGEN, AIR AND CARBON DIOXIDE  
A66-26191
- IONIC WAVE  
CALCULATIONS AND EXPERIMENTS TO DETERMINE ION WAVE  
INSTABILITY IN STEADY STATE DISCHARGE, LASER

- BREAKDOWN IN PLASMA, AND MICROWAVE SCATTERING  
FROM STANDING PLASMA WAVES A67-14628
- IONIZATION COEFFICIENT**  
MULTIPHOTON IONIZATION OF KRYPTON ATOM BY RUBY  
LASER RADIATION A67-18796
- IONIZATION CROSS SECTION**  
ATOMIC IONIZATION BY INTENSE OPTICAL FIELD, NOTING  
RUBY LASER-PULSE EFFECT ON INERT GAS BETWEEN  
ELECTRODES A66-26189  
MULTIPHOTON IONIZATION OF XENON ATOM IN POWERFUL  
ELECTRIC FIELD BY RUBY LASER RADIATION A66-39545  
REPLACEMENT OF POISSON BY POLYA DISTRIBUTION IN  
CALCULATING LASER INTENSITY THRESHOLD NECESSARY TO  
INDUCE IONIZATION BREAKDOWN IN GASES A66-39715  
ABSOLUTE DIRECT EXCITATION CROSS SECTION FROM  
NEUTRAL GROUND STATE FOR UPPER LEVELS OF  
TRANSITION IN ARGON LASER A67-12520
- IONIZATION POTENTIAL**  
MULTIPHOTON IONIZATION OF KRYPTON AND ARGON BY  
RUBY LASER RADIATION MAY OCCUR BY ABSORPTION A66-36721  
MERCURY, CESIUM AND RUBIDIUM VAPORS IONIZATION IN  
INTENSE RADIATION FLUX BY Q-SWITCHED RUBY LASER A66-41156
- IONIZED GAS**  
METAL WALL IONIZED ARGON LASERS, DISCUSSING USE OF  
WATER-COOLED QUARTZ DISCHARGE CHANNELS, CW  
LASERS, DEVELOPMENT OF SATISFACTORY METAL, ETC A66-25555  
TRANSITION PROBABILITIES AND LIFETIMES IN IONIZED  
ARGON GAS LASERS A66-26207  
ION LASERS INVOLVING ELECTRON TRANSITIONS IN ATOMS  
OR MOLECULES WITH LOST ELECTRONS A66-33249  
MERCURY, CESIUM AND RUBIDIUM VAPORS IONIZATION IN  
INTENSE RADIATION FLUX BY Q-SWITCHED RUBY LASER A66-41156  
THREE NEW VISIBLE CW LASER LINES IN DISCHARGE IN  
SINGLY-IONIZED CL A67-10373  
SPATIALLY RESOLVED HE- NE LASER HETERODYNE  
MEASUREMENTS OF ELECTRON NUMBER DENSITIES IN  
WEAKLY IONIZED AR PULSED DISCHARGES A67-17272  
POLARIZATION CHARACTERISTICS OF IONIZED ARGON  
LASER IN MAGNETIC FIELD A67-18542
- IONIZING RADIATION**  
FAST OVERLAP OF MICROWAVE RADIATION BY IONIZATION  
AUREOLE OF SPARK IN LASER BEAM A66-36719  
POLYA DISTRIBUTION DESCRIBING PHOTON CORRELATIONS  
IN IONIZING LASER BEAMS ENABLES DIFFERENTIATION  
BETWEEN VARIOUS MULTIPHOTON IONIZATION PROCESSES A67-13982
- IONOSPHERIC PROPAGATION**  
SPATIAL SELECTIVE FADING AS RANDOM PROCESS,  
DISCUSSING SPATIAL COHERENCE, WAVE NUMBER  
DISPERSION PROFILE, TIME DELAY PROFILE, ETC, IN  
IONOSPHERIC PROPAGATION A66-26859
- IRON**  
ZERO MAGNETIC FIELD MILLIMETER MASER USING  
TRIVALENT IRON ION IN HOST CRYSTALLINE STRUCTURE  
OF RUTILE /TITANIUM DIOXIDE/ AS ACTIVE MATERIAL A66-29018
- IRRADIATION**  
Q-SWITCH PULSED RUBY LASER IRRADIATION-INDUCED  
CHEMICAL DISSOCIATION AND IONIZATION IN RESIDUAL  
GASES A66-42076
- ISOLATOR**  
SATURABLE OPTICAL FILTER IN LASER AMPLIFICATION  
CHAIN USED AS ISOLATOR TO LIMIT RADIANCE  
DEPUMPING EFFECTS AD-632007 N66-30020
- ISOTOPE SHIFT**  
ISOTOPE SHIFTS AND FERMI RESONANCE ROLE IN CARBON  
DIOXIDE IR LASER A66-30176  
INTRACAVITY INTERFEROMETER LASER MEASUREMENTS OF  
POWER GAIN AND OUTPUT IN SINGLE-FREQUENCY AR  
LASER AND 6328-ANGSTROM NE ISOTOPE SHIFT A66-40110  
ISOTOPE SUBSTITUTION EFFECT ON NATURAL FREQUENCIES  
OF VIBRATIONAL-ROTATIONAL TRANSITIONS IN DIATOMIC  
AND TRIATOMIC MOLECULES AND GENERATION OF NEW IR  
MASER FREQUENCIES A67-16634
- ISOTROPIC MEDIUM**  
TRANSFER EFFICIENCY OF LASER PUMPING CAVITIES WITH  
DIFFUSELY REFLECTING WALL DETERMINED, BASED ON  
APPROXIMATELY ISOTROPIC NATURE OF LIGHT INSIDE  
CAVITY A66-35379
- J**
- JET FLOW**  
FIZEAU FRINGES PRODUCED IN LASER ILLUMINATED  
FABRY-PEROT INTERFEROMETER TO OBTAIN  
CONCENTRATION PROFILES IN TURBULENT AND LAMINAR  
JETS A67-17371
- JUNCTION**  
CHANGE IN BASIC BARRIER RELATION FOR  
HETEROJUNCTION COMPARED TO HOMOJUNCTION OF WIDE  
GAP EMITTER INJECTION LASER A67-17097
- JUNCTION DIODE**  
MINIMUM SPECTRAL LINE WIDTH, THRESHOLD CURRENT  
DENSITY, RADIATION-PEAK DISPLACEMENT AND POSSIBLE  
RECOMBINATION MECHANISM FOR GA SB LASER DIODE P-N  
JUNCTIONS IN COHERENT RADIATION A66-31764  
GALLIUM ARSENIDE LASERS OPERATING AT ROOM  
TEMPERATURE INVESTIGATED, BASED ON DIFFUSION P-N  
JUNCTIONS, DISCUSSING EMISSION SPECTRUM A66-36070  
AVALANCHE TRANSISTOR GENERATION OF JITTER-FREE  
NANOSECOND CURRENT PULSES FOR DRIVING GA AS LASER  
DIODES AT LOW TEMPERATURES A66-37453  
FAR-FIELD LIGHT EMISSION MODE PATTERN OF GA AS  
DIODE INJECTION LASERS, DIELECTRIC GRADIENT IN  
INVERSION LAYER AND REFRACTIVE INDEX IN JUNCTION A66-39743  
FABRICATION OF GALLIUM ARSENIDE LASER DIODES BY  
DIFFUSION AD-478538 N66-28726  
SEMICONDUCTOR LASER ARRAY STRUCTURE WITH COMMON  
N-TYPE SUBSTRATE AND INDIVIDUAL CONTACTS TO  
P-LAYER FOR HIGHER OPTICAL POWER OUTPUT A67-10023  
SURFACE EFFECT ON TEMPERATURE, I-V AND WATT-  
AMPERE CHARACTERISTICS OF P-N JUNCTION  
SEMICONDUCTOR INJECTION LASER DIODE AS COHERENT  
LIGHT SOURCE A67-10077  
MINIMUM SPECTRAL LINE WIDTH, THRESHOLD CURRENT  
DENSITY, RADIATION-PEAK DISPLACEMENT AND POSSIBLE  
RECOMBINATION MECHANISM FOR GA SB LASER DIODE P-N  
JUNCTIONS IN COHERENT RADIATION A67-10085  
CONTINUOUS COHERENT RADIATION OF GA AS  
SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT  
AMBIENT TEMPERATURE OF 77 DEGREES K A67-10548  
CONTINUOUS COHERENT RADIATION OF GA AS  
SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT  
AMBIENT TEMPERATURE OF 77 DEGREES K A67-11056

ELECTRON BEAM SPATIAL SCANNING OF COHERENT  
EMISSION OF GaAs JUNCTION LASER AT LOW  
TEMPERATURES, MAKING CURRENT DISTRIBUTION  
NONUNIFORM A67-18150

**K****KERR CELL**

SEGMENTED-ROD RUBY LASER STRUCTURE OPERATED AS  
GIANT PULSE LASER, USING KERR CELL TO PROVIDE  
Q-SWITCHING, NOTING NUMBER OF OSCILLATING MODES  
A66-25038

HIGH SPEED STROBOSCOPIC PHOTOGRAPHY USING KERR  
CELL MODULATED LASER SOURCE A66-30828

HIGH POWER NONSPIKING OPERATION OF RUBY LASER FOR  
CONTINUOUS OUTPUT ON MICROSCOPIC AND MACROSCOPIC  
SCALE A66-38242

MULTIPURPOSE ULTRAHIGH SPEED CAMERA SYSTEM, NOTING  
USE AS MONOSECOND KERR CELL, IMAGE CONVERTER AND  
GIANT LASER PULSE GENERATOR A66-41675

OUTPUT CHARACTERISTICS OF HALF-WAVE MODE KERR  
CELL RUBY OSCILLATOR USED AS OPTICAL RADAR FOR  
CLEAR AIR TURBULENCE / CAT/ DETECTION A67-12053

DEGENERATE STIMULATED FOUR-PHOTON INTERACTION AND  
FOUR-WAVE PARAMETRIC AMPLIFICATION OBSERVED IN  
RUBY LASER AND LIQUID CELL ARRANGEMENTS A67-16379

KERR CELL PROPERTIES NOTING FOUR-ELECTRODE CELL  
GIVING FREQUENCY SHIFT OF 60 MC FOR LASER BEAM  
A67-19552

**KERR EFFECT**

LINEAR INSTABILITY OF LASER PROPAGATION IN FLUID  
WITH COUPLING BETWEEN LIGHT AND MEDIUM A66-35034

LASER LIGHT MODULATION BY POCKELS OR KERR EFFECT  
FOR APPLICATION TO TELECOMMUNICATIONS SYSTEM,  
EXAMINING ELECTRICAL BIREFRINGENCE MODULATION  
A66-36262

ELECTRO-OPTIC LIGHT MODULATION USING POCKEL AND  
KERR EFFECTS IN CRYSTALS FOR COMMUNICATIONS  
APPLICATIONS, USING LASERS A66-42811

S HF MODULATION TECHNIQUES FOR LASER RADIATION,  
COVERING FARADAY, KERR AND POCKEL EFFECTS,  
CIRCULAR DICHROISM, ETC A67-13138

**KINETIC ENERGY**

AMPLIFICATION OF INTERACTION OF ATOMS AND OF  
PULSED OR PERIODIC COOLING OF TRANSPARENT MEDIA  
PRODUCED BY LASER BEAM, NOTING CHANGES IN KINETIC  
ENERGY OF ATOMS A66-26021

KINETIC ENERGIES OF IONS PRODUCED BY GIANT LASER  
PULSES, NOTING DEPENDENCE OF MEAN SQUARE ION  
VELOCITY ON PULSE PEAK INTENSITY A67-15099

**KINETIC EQUATION**

SECOND HARMONIC GENERATION BY LASER BEAMS OF  
FINITE SPECTRAL WIDTH, USING QUANTUM TRANSITIONS  
AND KINETIC EQUATIONS, NOTING SHAPE OF PUMPING  
LINE AT FUNDAMENTAL FREQUENCY A66-30845

BOOK ON LASER THEORY BASED ON KINETIC EQUATIONS  
WITH EMPHASIS ON EMISSION FROM LUMINESCENT CENTER  
TRANSITIONS, SEMICONDUCTOR JUNCTIONS AND RAMAN  
SCATTERING A66-32558

RADIATION CONTROL OF RUBY LASER BY DIFFRACTION  
MODULATOR WITH TRAVELING ULTRASONIC WAVE, NOTING  
COMPUTER SOLUTION OF KINETIC EQUATIONS OF  
POPULATION BALANCE, RADIATION DENSITY,  
CHARACTERISTIC DAMPING, ETC A66-33515

LIGHT ABSORPTION BY FREE CURRENT CARRIERS ROLE IN  
KINETIC EQUATIONS OF SEMICONDUCTOR  
LASER/RADIATION SYSTEM A66-34691

QUANTUM THEORY OF LASER MODEL, DERIVING KINETIC

EQUATIONS FOR RADIATION AND SINGLE-PARTICLE  
DENSITY MATRICES, USING BOGOLIUBOV EXPANSION  
PROCEDURE A66-36008

RADIATION CONTROL OF RUBY LASER BY DIFFRACTION  
MODULATOR WITH TRAVELING ULTRASONIC WAVE, NOTING  
COMPUTER SOLUTION OF KINETIC EQUATIONS OF  
POPULATION BALANCE, RADIATION DENSITY,  
CHARACTERISTIC DAMPING, ETC A66-42128

KINETIC EQUATION DERIVATION FROM DENSITY MATRIX  
FOR CASE OF QUANTUM GENERATION OF SECONDARY  
OPTICAL HARMONIC IN LASER CAVITY UNDER VARIOUS  
OPTICAL PUMPING CONDITIONS A67-13127

LIGHT ABSORPTION BY FREE CURRENT CARRIERS ROLE IN  
KINETIC EQUATIONS OF SEMICONDUCTOR LASER/RADIATION  
SYSTEM A67-14376

**KINETICS**

CONTINUOUS HELIUM-NEON LASER USED TO OBTAIN  
SHORT INTENSE LIGHT PULSES AND TO STUDY KINETICS  
OF AUTOPHOTOELECTRONIC EMISSION OF HIGH  
RESISTIVITY SILICON A67-13142

**KLYSTRON**

TUNING RANGE EXTENSION OF KLYSTRONS USED FOR  
PUMPING S-BAND TRAVELING WAVE MASERS N67-14441

**KRYPTON**

MULTIPHOTON IONIZATION OF KRYPTON ATOM BY RUBY  
LASER RADIATION A67-18796

**L****L-BAND**

L-BAND TRAVELING WAVE MASER USING CHROMIUM DOPED  
RUTILE, DISCUSSING INVERTED SUSCEPTIBILITY AS  
FIGURE OF MERIT A66-38239

**LABORATORY APPARATUS**

LASER APPLICATION SURVEY A66-35798

**LAMINAR JET**

FIZEAU FRINGES PRODUCED IN LASER ILLUMINATED  
FABRY-PEROT INTERFEROMETER TO OBTAIN  
CONCENTRATION PROFILES IN TURBULENT AND LAMINAR  
JETS A67-17371

**LANDAU DAMPING**

CROSS SECTION FOR INELASTIC SCATTERING OF  
ELECTROMAGNETIC RADIATION BY ELECTRON DENSITY  
FLUCTUATIONS IN ANISOTROPIC SOLIDS, USING LASER  
SOURCES, INVESTIGATING LANDAU AND COLLISION  
DAMPING OF PLASMONS A66-26153

**LANDING SYSTEM**

RADIATION ATTENUATION EFFECT OF ATMOSPHERIC  
AEROSOLS ON ALL-WEATHER AIRCRAFT LANDING GUIDANCE  
SYSTEMS USING LASERS A66-36051

**LANGMUIR PROBE**

LANGMUIR PROBE USE FOR ELECTRON TEMPERATURE  
DETERMINATION IN LASER-INDUCED PLASMA  
BRL-MR-1715 N66-28920

**LANTHANIDE**

SOLID STATE REDUCTION OF LANTHANIDE IONS IN LASER  
HOSTS, EFFECT OF PRESENCE OF RECOMBINATION HOLE-  
CENTERS IN PHOTOREDUCTION SAMPLES AND ELIMINATION  
DURING ELECTROCHEMICAL PROCESS A66-27464

**LANTHANUM CHLORIDE**

NONEQUILIBRIUM POPULATION BUILDUP AND DETECTION  
FOR IR SOLID STATE LASERS AND I R-OPTICAL  
DOUBLE RESONANCE IN LANTHANUM CHLORIDE CRYSTAL  
A66-26177

**LAPLACE TRANSFORM**

LASER AMPLIFIER THEORY USING FABRY-PEROT  
INTERFEROMETER AND LAPLACE TRANSFORM FOR  
OBTAINING TRANSIENT SOLUTIONS IN ADDITION TO  
STEADY STATE SOLUTIONS A66-39224

**LASER COMMUNICATION**

OPTICAL COMMUNICATION FOR MARS EXPLORATION WITH  
OUTLINE OF LASER MODULATORS AND ANTENNAS A66-25251

- SOLAR NOISE IN OPTICAL COMMUNICATIONS, BACKGROUND RADIATION DEPENDENCE ON DETECTOR APERTURE, NOISE POWER AND APPLICATION TO GA AS DIODES AND GAS LASERS A66-25833
- F M LASER AND OPTICAL HETERODYNES IN OPTICAL COMMUNICATION SYSTEMS A66-26004
- OPTICAL COMMUNICATION USING LASER TECHNIQUES A66-26918
- ATMOSPHERIC TURBULENCE EFFECTS ON LASER BEAM PROPAGATION, NOTING BEAM CROSS SECTION, PHASE VARIATION, AM AND FM, ETC A66-27035
- COHERENT TRANSMISSION OF OPTICAL RADAR FROM LASER SOURCE AND USE OF RF SUBCARRIERS PLACED ON OPTICAL BEAMS FOR WIDEBAND COMMUNICATIONS PURPOSES A66-28404
- MULTIPLE SCATTERING EFFECTS ON PROPAGATION OF COHERENT OPTICAL SIGNALS STUDIED FOR LASER COMMUNICATIONS APPLICATION A66-28580
- LASER COMMUNICATION BY OPTICAL BEAM WAVEGUIDE A66-30594
- P-N JUNCTION LASERS FOR SHORT RANGE COMMUNICATIONS, EXAMINING DESIGN, TECHNOLOGICAL PROBLEMS AND PERFORMANCE A66-31956
- SPACE COMMUNICATION REQUIREMENTS USING LASERS AND MICROWAVES IN MANNED MARS FLIGHTS AIAA PAPER 65-324 A66-33794
- ACQUISITION AND REACQUISITION IN SPACECRAFT-SPACECRAFT AND SPACECRAFT-TO-EARTH COMMUNICATIONS USING LASER SYSTEMS A66-33795
- ULTRASONIC CELL WHICH MODULATES INTENSITY OF HE- NE LASER BEAM FOR COMMUNICATION OF INTELLIGENCE A66-34059
- SYSTEM DESIGN ANALYSIS OF LASER METHODS OF DEEP SPACE COMMUNICATION, EXAMINING LOCAL HETERODYNE SYSTEM / LHS/, DIRECT DETECTION SYSTEM / DDS/ AND TRANSMITTED REFERENCE SYSTEM A66-35666
- BOOK ON LASER RECEIVERS COVERING NOISE PERFORMANCE, ATMOSPHERIC EFFECTS, DETECTION TECHNIQUES, HARDWARE AND SYSTEMS AVAILABLE, OPTICAL COMMUNICATION IN VISIBLE AND IR SPECTRUM, ETC A66-36060
- LASER LIGHT MODULATION BY POCKELS OR KERR EFFECT FOR APPLICATION TO TELECOMMUNICATIONS SYSTEM, EXAMINING ELECTRICAL BIREFRINGENCE MODULATION A66-36262
- COHERENT LASER LIGHT USE IN ATMOSPHERIC COMMUNICATIONS SYSTEM, DISCUSSING EFFECT OF ATMOSPHERIC TURBULENCE AND SMALL VIBRATIONS ON COHERENT DETECTION EFFICIENCY AND SNR A66-36930
- LASER COMMUNICATIONS SYSTEM DESIGN, DESCRIBING RANGE EQUATION, MODULATION AND DETECTION TECHNIQUES, ATMOSPHERIC EFFECTS, ETC A66-37257
- NARROW LASER BEAM POINTING TECHNIQUE IN DEEP SPACE-TO-EARTH DATA TRANSMISSION FOR REDUCTION IN ERROR SOURCES A66-40496
- ATMOSPHERIC TURBULENCE EFFECT ON LASER BEAM INTENSITY DISTRIBUTION A66-41030
- ATMOSPHERIC TURBULENCE EFFECT ON FREQUENCY SPECTRA OF LIGHT INTENSITY FLUCTUATIONS EXAMINED, USING HE- NE LASER A66-41031
- TROPOSPHERIC PROPAGATION USING LASER AS TRANSMITTER, ANALYZING EFFECTS OF BENARD CELLS, TURBULENCE, WIND SHEAR, ETC A66-42367
- OPTICAL COMMUNICATION SYSTEMS, DISCUSSING AVAILABLE EQUIPMENT, TRANSMISSION CHARACTERISTIC, LACK OF LONG DISTANCE OPERATION RELIABILITY, ETC A66-42805
- ELECTRO-OPTIC LIGHT MODULATION USING POCKEL AND KERR EFFECTS IN CRYSTALS FOR COMMUNICATIONS APPLICATIONS, USING LASERS A66-42811
- BOOK ON LASER APPLICATIONS IN RADIO COMMUNICATION SYSTEMS A66-43226
- PHOTOELECTRONIC COMPONENTS AND ELECTRONIC MEASUREMENT TECHNIQUES IN RECEPTION AND DEMODULATION OF HF MODULATED LASER BEAMS A67-10300
- VOICE COMMUNICATIONS SYSTEM USING GA AS ROOM-TEMPERATURE INJECTION LASER AND TV COMMUNICATIONS SYSTEM USING GA AS CRYSTALS AS MODULATORS FOR LASER BEAMS A67-11786
- LASER APPLICATION TO RADAR SIGNAL PROCESSING AND COMMUNICATIONS EQUIPMENT A67-15303
- SYSTEM DESIGN ANALYSIS OF LASER METHODS OF DEEP SPACE COMMUNICATION, EXAMINING LOCAL HETERODYNE SYSTEM / LHS/, DIRECT DETECTION SYSTEM / DDS/ AND TRANSMITTED REFERENCE SYSTEM A67-17635
- GA AS ROOM TEMPERATURE LASER DIODE APPLICATION TO COMMUNICATION AND RADAR SYSTEMS A67-19086
- STATISTICAL MODELS USED IN COMPUTER PROGRAM TO SIMULATE ATMOSPHERE EFFECT ON LASER RECEIVER N67-15746
- LARGE APERTURE TELESCOPE FOR USE AS COHERENT OPTICAL DEEP SPACE COMMUNICATIONS RECEIVER NASA-CR-81677 N67-17946
- OPTICAL SUPERHETERODYNE RECEIVER NASA-CR-81659 N67-17982
- LASER MODE**
- SEGMENTED-ROD RUBY LASER STRUCTURE OPERATED AS GIANT PULSE LASER, USING KERR CELL TO PROVIDE Q-SWITCHING, NOTING NUMBER OF OSCILLATING MODES A66-25038
- MULTIMODE RUBY RESONATOR OUTPUT AS AFFECTED BY MODE NUMBER AND MODE DEGENERACY A66-25043
- SECOND HARMONIC GENERATED BY TRANSMITTING LASER RADIATION THROUGH TELLURIUM MONOCRYSTAL, WHILE FILTERING OUT FUNDAMENTAL FREQUENCY A66-25437
- DIGITAL-MODE FM CW LASER RANGING AND TRACKING SYSTEM USING COMPOUND AXIS SERVOMECHANISM A66-25982
- NATURAL MODES OF PLANE AND CYLINDRICAL DIELECTRIC RESONATORS IN OPTICAL BAND A66-26042
- LASER OSCILLATION AND ENERGY LOSSES IN MEDIUM CONTAINING ACTIVE MOLECULES A66-26043
- ATMOSPHERIC OBSERVATION WITH ADVANCED LIGHT RADAR, NOTING EQUIPMENT CHARACTERISTICS, MOLECULAR SCATTERING MECHANISM, ETC A66-26133
- PARAMETRIC OSCILLATOR THEORY APPLIED TO TUNABLE COHERENT OPTICAL PARAMETRIC OSCILLATION IN LITHIUM NIOBATE A66-26145
- RAMAN LIGHT FORWARD EMISSION IN LIQUIDS WHEN ILLUMINATED BY LASER, OBTAINING STIMULATED RAMAN ACTION WITHOUT FEEDBACK, WHICH SUGGESTS EXISTENCE OF MECHANISM CONTRIBUTING TO MODULATION OF MEDIUM POLARIZABILITY A66-26160
- LASER ACTION IN GALLIUM ANTIMONIDE DIODES, EXAMINING EMITTED LIGHT SPECTRUM VS INJECTED CURRENT, TEMPERATURE EFFECT, RADIATIVE EFFICIENCY, ETC A66-26184
- SPONTANEOUS AND COHERENT EMISSION FROM LEAD SULFIDE, TELLURIDE AND SELENIDE DIODE LASERS IN ORIENTED MAGNETIC FIELD, DETERMINING BAND EDGE PARAMETERS FROM SPIN-SPLIT ZERO ORDER LANDAU LEVEL TRANSITIONS A66-26185

MULTIPLE QUANTUM EQUATIONS FOR MODE AMPLITUDE AND  
FREQUENCY DETERMINATION FOR MAGNETIC FIELD-TUNED  
GAS OPTICAL MASER A66-26200

DEPENDENCE OF ZEEMAN BEAT FREQUENCY ON  
INTERFEROMETER TUNING IN SINGLE-MODE HE- NE LASER  
WITH VARIOUS GAS PRESSURES AND MAGNETIC FIELD  
STRENGTHS A66-26201

HIGH RESOLUTION PIEZOELECTRICALLY SCANNED FABRY-  
PEROT INTERFEROMETER USED TO STUDY GAIN PROFILES,  
MODE STRUCTURES AND EMISSION LINE WIDTHS OF CW  
AR, KR AND XE ION LASERS AND HG- HE PULSED  
LASER A66-26208

CORRELATIONS AND INTENSITY FLUCTUATIONS IN LIGHT  
FROM INDIVIDUAL LASING AND NONLASING MODES OF CW  
GA AS LASER AND THRESHOLD NOISE CHANGE IN LASER  
EMISSION A66-26210

PERIODIC UNDAMPED OSCILLATIONS IN POWER INTENSITY  
OF TWO-MODE OPTICAL MASER A66-26217

ABSOLUTE FLUX MEASUREMENT FOR PULSED AND TRIGGERED  
LASERS REQUIRING ONLY QUANTUM RECEIVERS A66-26375

PHASE LOCKING OF ONE LASER TO ANOTHER BY DIRECT  
INJECTION OF FIRST LASER BEAM INTO SECOND LASER  
CAVITY A66-26593

RELAXATION OSCILLATION IN SINGLE-MODE OPERATION OF  
ROOM-TEMPERATURE CW RUBY LASER A66-27026

STEADY STATE REGIME OF ELECTROMAGNETIC OSCILLATION  
IN LASER A66-27065

AXIAL AND TRANSVERSE MODE SELECTION, EMISSION  
SPECTRUM AND TRANSIENT EMISSION BEHAVIOR OF  
CONFOCAL RUBY LASER OPERATED IN ELLIPSOIDAL  
PUMPING SYSTEM A66-27606

EXPERIMENTAL OBSERVATION OF REGULAR SPIKING IN  
NEODYMIUM DOPED GLASS LASER ROD ATTRIBUTED TO  
SIMULTANEOUS OSCILLATION OF MANY TRANSVERSE AND  
LONGITUDINAL MODES A66-28727

SOLAR PUMPING AND MODULATION OF VARIOUS LASER  
MATERIALS FOR DEEP SPACE COMMUNICATION, NOTING TV  
PICTURE TRANSMISSION A66-28971

HYSTERESIS PHENOMENA IN HE- NE GAS LASER IN AXIAL  
MAGNETIC FIELD AND POLARIZATION OF OSCILLATING  
MODE WITHIN CERTAIN TUNING REGION A66-29385

REVERSIBLE BLEACHABLE DYE-SOLUTIONS FOR EXPANDER  
ELEMENTS IN LASER A66-29388

ULTRASHORT OPTICAL PULSES GENERATED BY MODE  
LOCKING CONTINUOUS NEODYMIUM DOPED YTTRIUM-  
ALUMINUM GARNET LASER A66-29391

TIME CHARACTERISTICS IN GENERATION OF GIANT LASER  
PULSE STUDIED BY CIRCUIT WITH PRISMATIC SHUTTERS  
A66-29702

CRYSTAL MOTION EFFECT ON TIME BEHAVIOR OF LASER  
GENERATION MODE, USING HIGH SPEED PHOTOGRAPHY AND  
OSCILLOGRAMS A66-29725

LENGTH DEPENDENT THRESHOLD DATA FOR STIMULATED  
RAMAN EMISSION IN LIQUIDS, NOTING CORRELATION  
BETWEEN LASER BEAM SELF-FOCUSING AND ONSET OF  
RAMAN EMISSION A66-30157

NONUNIFORM PUMPING EFFECTS ON NEAR-AXIAL LOW-ORDER  
TRANSVERSE MODE STRUCTURE IN SOLID STATE LASER  
CAVITY A66-31087

MODE LOCKING IN GASEOUS LASER WHOSE CAVITY IS  
LENGTH MODULATED AT MODE SEPARATION FREQUENCY  
A66-31095

Modes of TILT-MIRROR OPTICAL RESONATOR, USING  
SPILLOVER RADIATION TO EXTRACT COHERENT FAR IR  
A66-31134

IONIZATION OF AIR WITH LASER RADIATION IN SPIKE  
MODE A66-31150

LINEAR ABSORPTION EFFECT ON THRESHOLD FOR SELF-  
FOCUSING OF LASER BEAM IN CADMIUM SULFIDE, NOTING  
VARIATION OF ABSORPTION COEFFICIENT A66-31537

LASER MODE OPERATION IN PRESSURE OF RADIATION  
ABSORBING IMPURITY ANALYZED BY EXTENDED THOMSON  
TYPE SYSTEM A66-31558

LOW NOISE PHOTODIODES WITH AVALANCHE  
MULTIPLICATION FOR HIGH SENSITIVITY, NOTING  
CAPABILITY FOR LOW INTENSITY WIDEBAND SIGNAL  
DETECTION, PERFORMANCE IN IR REGION, ETC A66-31934

SECOND-HARMONIC ENHANCEMENT IN NONLINEAR CRYSTAL  
BY LOSS MODULATOR COUPLING OF PULSED RUBY LASER  
MODES A66-31939

STEADY STATE OSCILLATIONS OF MOLECULAR BEAM LASER  
WITH INHOMOGENEOUS SINUSOIDAL FIELD IN RESONATOR  
A66-32243

LASER OPERATED WITH SATURABLE FILTER FOR Q-  
SWITCHING, NOTING TWO MODES OF EXCITATION /SOFT  
AND HARD REGIME/ A66-32314

EFFECT OF ANOMALOUS DISPERSION ON STIMULATED  
EMISSION SPECTRUM OF DOPED CADMIUM FLUORIDE  
CRYSTALS A66-32317

SELECTIVE DIFFUSED JUNCTION LASER, DISCUSSING  
GA AS LASER USED FOR QUENCHING EXPERIMENT A66-32408

FABRY- PEROT ETALON USE FOR INTERFEROMETRY AND  
LASER CONTROL, NOTING LOW ANGLE SCATTERING, LASER  
OSCILLATION, THERMAL TUNING SENSITIVITY, ETC A66-32619

OSCILLATION CONDITIONS FOR FEEDBACK LASERS,  
SUPERRADIANT DIRECTIONALLY COHERENT EMISSION  
LASERS AND COHERENCE BRIGHTENED EMISSION LASERS  
A66-32628

MICHELSON INTERFEROMETER USED TO STUDY MODES OF  
RED HE- NE LASER A66-33316

LASER RADAR RANGING SYSTEM USING PSEUDORANDOM CODE  
MODULATION, CONSIDERING APPLICATION TO PULSE AND  
DIGITAL CIRCUITRY, STATISTICAL COMMUNICATION  
THEORY AND ELECTRO-OPTICAL ENGINEERING A66-33557

MODE CHARACTERISTICS OF SOLID STATE LASERS FROM  
ANALYTICAL SOLUTION OF CONSERVATIVE EQUATION  
A66-33839

OPTICAL FREQUENCY BREAKDOWN THRESHOLD OF INERT GAS  
MIXTURES, USING FOCUSED BEAM RADIATION FROM Q-  
SPOILED NEODYMIUM LASER A66-34236

DERIVATION OF TWO EQUATIONS FOR ELECTROMAGNETIC  
FIELD AND POPULATION INVERSION IN SOLID STATE  
LASER A66-35370

SELF-MODULATION OF LASER WITH TWO-MODE RESONATOR  
A66-35372

TRANSFER EFFICIENCY OF LASER PUMPING CAVITIES WITH  
DIFFUSELY REFLECTING WALL DETERMINED, BASED ON  
APPROXIMATELY ISOTROPIC NATURE OF LIGHT INSIDE  
CAVITY A66-35379

DOPPLER SHIFT AND HIGH VELOCITY MIRROR  
TRANSLATION EFFECTS ON MUTUAL OPTICAL COHERENCE  
FUNCTION OF GAS LASER MICHELSON INTERFEROMETERS  
A66-35387

LASER MIRROR TRANSDUCER DECOUPLING FROM MECHANICAL  
RESONANCES OF LASER CAVITY A66-35813

MODE THEORY OF SPHERICAL MIRROR RESONATORS,  
DISCUSSING DIFFRACTION LOSSES, RESONANT  
CONDITIONS, MODE PATTERNS, INTERNAL FOCUSING  
ELEMENTS, MODE SELECTION, ETC A66-36972

SECOND HARMONIC FREQUENCY GENERATION OBTAINED IN  
PROCESS OF OPTICAL MIXING OF COLLINEAR NEODYMIUM  
LASER BEAMS IN POTASSIUM DIHYDROGEN PHOSPHATE  
A66-37550

PHASE RELATIONS OF LONGITUDINAL MODES IN GAS LASER  
WITH ANNULAR RESONATOR A66-37663

EXCITATION OF AXIAL OSCILLATION MODES IN  
SEMICONDUCTOR LASERS ANALYZED, BASED ON RATE  
EQUATIONS FOR CHEMICAL POTENTIALS OF CARRIERS AND  
NUMBER OF PHOTONS A66-37687

ELECTRON BEAM SCANLASER BASED ON LASER CAVITY  
DIRECTLY AND/OR TRANSVERSELY DEGENERATE HAVING Q-  
SPOILED FOR ALL MODES BUT ONE A66-38244

PULSED-MODE GAIN CHARACTERISTICS IN NEODYMIUM-  
DOPED SILICATE GLASS LASER EXPERIMENTALLY RELATED  
TO GIANT-PULSE LASER ENERGY OUTPUT A66-38396

COUPLING OF ADJACENT AXIAL MODES IN EXTERNAL  
RAMAN RESONATOR OBSERVED AS FIRST STOKES  
FREQUENCY WITH BENZENE AS RAMAN MEDIUM AND Q-  
SWITCHED RUBY LASER AS PUMP SOURCE A66-39109

QUENCHING AND HYSTERESIS EFFECTS BETWEEN ZEEMAN  
OSCILLATIONS ON SINGLE AXIAL MODE OBSERVED IN  
NEAR-ZERO MAGNETIC FIELDS FOR SHORT PLANAR LASER  
A66-39116

LASER MODE-LOCKING DURING RESONATOR Q-FACTOR  
MODULATION A66-39303

STABLE LIMITING CYCLES OF LASER RESULTING FROM  
MUTUAL SYNCHRONIZATION OF PHASE-SHIFTED  
OSCILLATION MODES A66-39653

FREQUENCY DOUBLING OF LASER LIGHT WITH VARIABLE  
Q-SWITCHED RESONATOR A66-39654

INTENSITY AND FREQUENCY EQUATIONS FOR INTERBAND  
OPTICAL TRANSITIONS AND MULTIMODE PROPERTIES IN  
SEMICONDUCTOR LASERS A66-39666

ATOMIC DEGENERACY INFLUENCE ON MODE INTERACTIONS  
IN GAS LASER A66-39930

C W RUBY LASER OF 10-MM LENGTH IN ELLIPSOIDAL  
PUMPING SYSTEM UNDER WATER COOLING, NOTING VARIOUS  
MODES A66-40100

ELECTRON THERMALIZATION EFFECT ON SEMICONDUCTOR  
LASER BEHAVIOR, NOTING OPTICAL TRANSITION BETWEEN  
IMPURITY LEVEL AND BAND, TAKING INTO ACCOUNT  
DIFFUSION PROCESS A66-40790

STEADY STATE REGIME OF ELECTROMAGNETIC OSCILLATION  
IN LASER A66-40824

DEPENDENCE OF BEAT FREQUENCY OF NEODYMIUM LASER  
AXIAL MODES ON DISTANCE BETWEEN MIRRORS AND  
NEODYMIUM ROD POSITION WITHIN RESONATOR A66-41088

THEORY OF STEADY MULTIMODE OSCILLATION OF SOLID  
STATE LASER EXTENDED TO CAVITIES WITH INEFFICIENT  
END MIRRORS OR LOSSES DEPENDENT ON FREQUENCY  
A66-41274

FREQUENCY TUNING OF COHERENT EMISSION OVER  
VIBRONIC CONTINUUM OF PHONON-TERMINATED OPTICAL  
MASERS BY THERMAL TUNING AND WAVELENGTH-SELECTIVE  
FEEDBACK A66-41369

QUANTUM THEORY OF Q-SPOILED LASER, NOTING  
STATISTICS OF NUMBER OF PHOTONS IN MODE BEAR  
QUALITATIVE RESEMBLANCE TO POISSON STATISTICS  
A66-41373

PARASITIC INTERNAL OSCILLATIONS IN LASER CRYSTAL  
WITH DIELECTRIC ROD CAUSED BY TOTAL REFLECTION  
FROM GENERATRIX OF CYLINDRICAL SAMPLE A66-41477

RUBY LASER GIANT PULSE OFF-AXIAL MODES DETECTED  
WITH HIGH RESOLUTION SPHERICAL FABRY-PEROT

INTERFEROMETER A66-41627

SPECTRAL WIDTH OF PEAK TYPE AND MONOPULSE TYPE  
RADIATION OF SOLID-BODY LASER IN NONSTATIONARY  
REGIME A66-42133

PHOTOELECTRON EMISSION STATISTICS DETERMINING  
PROBABILITY DISTRIBUTION OF PHOTOELECTRON COUNTS  
IN PHOTOMULTIPLIER ILLUMINATED BY LASER BELOW AND  
ABOVE THRESHOLD OF OSCILLATION A66-42543

MODE SELECTION, RELAXATION OSCILLATIONS, MODE  
INTERACTION AND THERMAL EFFECTS IN ROOM  
TEMPERATURE CW LASERS IN ELLIPSOIDAL PUMPING  
SYSTEMS A66-42546

SPECTROSCOPY OF IR EMISSION AND LASER OSCILLATION  
RESULTING FROM TRANSIENT POPULATION INVERSIONS ON  
ELECTRONIC TRANSITIONS IN MOLECULAR NITROGEN  
A66-42550

CURRENT MEASURING DEVICE FOR EHV TRANSMISSION  
LINE, OBTAINING INSTANTANEOUS MAGNETIC FIELD BY  
GAUGING FARADAY ROTATION ANGLE OF LASER BEAM IN  
FLINT GLASS ROD A66-42556

SINGLE TRANSVERSE AND LONGITUDINAL MODES OBSERVED  
IN OUTPUT OF PASSIVE Q-SWITCHED RUBY LASER WHEN  
TWO SPHERICAL MIRRORS ARE USED FOR RESONATOR A66-42563

MODE COUPLING IN RUBY LASER WITH REACTANCE PLACED  
WITHIN CAVITY RESONATOR WITH MODULATION FREQUENCY  
CLOSE TO SEPARATION OF AXIAL MODES, EXAMINING  
ELECTRIC FIELD ENVELOPE A66-42565

SCATTERING MATRIX ANALYSIS OF SINGLE FREQUENCY  
MICHELSON TYPE HE-NE GAS LASER, INCLUDING  
FREQUENCY AND AMPLITUDE STABILITY ANALYSIS OF  
OSCILLATION SPECTRUM A66-42566

LASER BEAMS AND RESONATORS, DISCUSSING BEAM  
PROPAGATION IN FREE SPACE, GEOMETRICAL OPTICS  
APPLICATION AND RESONATOR MODES IN VIEW OF  
APERTURE DIFFRACTION EFFECTS A66-42806

LASER MODE CONTROL AND STABILIZATION USING  
INTERNAL TIME-VARYING PERTURBATION A66-42813

PROPERTIES OF FM AND SUPER-MODE HELIUM-NEON  
LASERS, AND ABSOLUTE FREQUENCY STABILIZATION OF  
FM LASER  
IER-4 N66-35096

RUBY LASER MODE SELECTION AND PULSE AMPLIFICATION  
IPP-4/49 N66-38698

GENERATING MODE NUMBER IN SOLID STATE LASERS USING  
TRAVELING WAVE AND STANDING WAVE A67-10069

COMPETITION OF TWO TYPES OF OSCILLATIONS IN  
TRAVELING WAVE LASER A67-10362

SINGLE SELF-MODE-LOCKED PULSE SELECTION FROM  
BLEACHABLE DYE Q-SWITCHED ND-DOPED GLASS LASER  
A67-10875

OPTICAL PUMPING WITH DIODE LASER INTO FABRY-  
PEROT RESONATOR FACE OF THIN HIGHLY-ABSORBING  
SEMICONDUCTOR, NOTING VARIABLE MODE SPACING  
INCLUDING SINGLE MODE OUTPUT A67-10879

SPONTANEOUS EMISSION SPECTRA AND RATIO OF NUMBER  
OF PHOTONS IN VARIOUS OSCILLATION MODES OF LASER  
WITH NONLINEAR FILTER TYPE LOCK A67-11573

OPTICAL FREQUENCY TRANSLATION OF PULSES FROM MODE  
LOCKED LASER, NOTING DOPPLER SHIFTS OF LARGE  
MAGNITUDE A67-12506

FIRST AND SECOND ORDER CORRELATION FUNCTIONS FOR  
FIELD OBTAINED BY SUPERPOSITION OF TWO LASER MODES  
THROUGH YOUNG'S EXPERIMENT, USED TO DETERMINE  
COHERENCE AND STATISTICAL PROPERTIES A67-12634

LASER EMISSION IN PURE CADMIUM SULFIDE CRYSTALS  
BOMBARDED BY ELECTRON BEAMS A67-12812

POSSIBLE OSCILLATION MODES IN CYLINDRICAL SOLID  
STATE LASER AND DEPENDENCE OF PUMPING THRESHOLD,  
OUTPUT POWER AND DIVERGENCE ANGLE ON RESONATOR  
LENGTH A67-13129

EFFECT OF DIFFUSION OF EXCITATION ON CONDITIONS OF  
MULTIMODE GENERATION IN LASER RADIATION A67-13207

MODE CHARACTERISTICS OF SOLID STATE LASERS FROM  
ANALYTICAL SOLUTION OF CONSERVATIVE EQUATION A67-13208

STEADY STATE REGIME AND STABILITY OF TWO-PHOTON  
LASER, NOTING FIELD DEPENDENCE OF INTENSITY AND  
DURATION OF FREQUENCY PULSE AND RESONANCE  
EXCITATION CURVES A67-14745

OBLIQUE MODES AND ENERGY OF GAS LASER BEAM  
A67-14913

AMPLITUDE AND FREQUENCY CHARACTERISTICS OF  
TRAVELING WAVE RING LASER A67-15777

INERTIAL SENSORS, DISCUSSING MAGNETIC RESONANCE  
AND SUPERCONDUCTOR GYROSCOPES, RING LASERS, FLUID  
DYNAMICAL DEVICES, ELECTROSTATIC GYROSCOPES, ETC  
A67-16517

EXCESS PHOTON NOISE IN DETECTED PHOTOCURRENT OF  
MULTIMODE LASER FOR UNCOUPLED AND PHASE LOCKED  
MODES A67-16623

ACCURACY AND LIMIT ANALYSIS OF STATISTICAL  
DISTRIBUTION OF EM RADIATION FIELD BY  
PHOTOELECTRON COUNTING DISTRIBUTIONS FROM  
PHOTODETECTOR FOR SINGLE MODE LASER NEAR THRESHOLD  
A67-16624

INTERNALLY SCANNED LASER BEAM HAVING HIGH  
DEFLECTION RATE PRODUCED BY PULSED OPTICAL DELAY  
LINE A67-16647

LASER BRIGHTNESS GAIN AND SINGLE TRANSVERSE MODE  
OPERATION BY COMPENSATION FOR THERMAL DISTORTION  
WITH EXTERNAL MIRROR A67-16656

MULTIPHOTON ABSORPTION PROCESSES, COHERENCE OF  
RADIATION FIELDS AND STATISTICAL PROPERTIES OF  
LASER LIGHT ABSORPTION A67-16681

HYPERSONIC EXCITATIONS DUE TO BRILLOUIN  
SCATTERING FOR CASE WITH STOKES FEEDBACK,  
DERIVING QUANTUM EQUATION OF MOTION FOR CREATION  
OF LASER AND STOKES MODES AND COUPLED ACOUSTIC  
MODE A67-16683

SUPPRESSION OF UNDESIRABLE AXIAL MODES IN GAS  
LASER OSCILLATING AT SEVERAL FREQUENCIES OBTAINED  
BY FILLING WITH ACTIVE GAS MIXTURE EACH OF TWO  
COUPLED FABRY-PEROT TYPE RESONATORS A67-17326

COMPETITION OF TWO TYPES OF OSCILLATIONS IN  
TRAVELING WAVE LASER A67-17620

NONLINEAR MEDIUM ANISOTROPY AND SATURATION  
EFFECTS ON ORIENTATION OF POLARIZATION ELLIPSE OF  
GAS LASER MODE A67-17823

OPTICAL MASER OSCILLATION LINES IN HF DISCHARGE  
IN MIXTURE OF AR AND BR A67-18545

LASER LINE-SCANNING PHOTOGRAPHIC SYSTEM,  
DISCUSSING POSSIBLE EXTRATERRESTRIAL APPLICATIONS  
A67-19011

LASER STUDIES AT RCA VICTOR RESEARCH  
LABORATORIES, MONTREAL, DISCUSSING  
SPECTROSCOPIC, INTERFEROMETRIC AND PLASMA  
DIAGNOSTIC RESEARCH A67-19082

LASER APPLICATION TO METEOROLOGY, DISCUSSING  
RAYLEIGH, AEROSOL AND RAMAN SCATTERING, SYSTEM  
CONFIGURATION AND MEASUREMENT PROBLEMS A67-19091

WAVE INTERACTION IN SATURABLE ABSORBERS, NOTING  
HOLE BURNING IN DYE SWITCHED RUBY LASER A67-20094

RUBY LASER MODE LOCKING AND MODE COMPETITION USING  
RG-8 FILTER AS PASSIVE MODULATOR A67-20147

SELF-FOCUSING AND TRAPPING OF LASER BEAM IN LIQUID  
N67-12650

AUTOMATIC LASER BEAM DETECTOR AND INSTANTANEOUS  
TRANSVERSE ELECTROMAGNETIC MODE ANALYSIS OF  
HELIUM-NEODYMIUM LASER N67-16952

EXTERNAL MIRROR FOR LASER BRIGHTNESS GAIN AND  
THERMAL COMPENSATING MODE CONTROL N67-16954

LASER OPERATION ON CIRCULARLY POLARIZED MODE  
AFDSR-66-2679 N67-17274

CIRCULARLY POLARIZED LASER MODES IN RUBY LASER  
MATERIAL N67-17277

LASER SYSTEM FOR DYNAMICALLY BALANCING GYRO ROTORS  
AND STATICALLY BALANCING ACCELEROMETERS  
NASA-CR-82449 N67-19130

LASER OUTPUT  
SEGMENTED-ROD RUBY LASER STRUCTURE OPERATED AS  
GIANT PULSE LASER, USING KERR CELL TO PROVIDE  
Q-SWITCHING, NOTING NUMBER OF OSCILLATING MODES  
A66-25038

RUBY LASER AMPLIFIER DYNAMICS, NOTING AMPLIFICATION  
IN ENERGY GAIN REGIMES AND CORRELATION TO  
THEORETICAL EQUATIONS A66-25049

FORMATION OF ULTRASONICALLY GATED GIANT LASER  
PULSES BY Q-SPOILING, NOTING PHOTOGRAPHS OF RUBY  
AND ROLE OF CAVITATION IN GATING MECHANISM  
A66-25057

TRAVELING WAVE BEATS CREATED BY RING LASER ON  
ROTATING PLATFORM, NOTING FREQUENCY DIVISION  
ROTATING RATE AND CAPTURE BAND PARAMETERS  
A66-25102

FREQUENCY SHIFT IN RESONANCE TRANSITION INDUCED IN  
POTASSIUM VAPOR BY RUBY LASER PULSE  
A66-25103

HOLOGRAMS AND WAVEFRONT RECONSTRUCTION TECHNIQUES  
INVOLVING PRISMATIC REFRACTION OF MONOCHROMATIC  
AND COHERENT LASER LIGHT CAUSING INTERFERENCE  
PATTERN ON PHOTOGRAPHIC EMULSION  
A66-25144

CAVITY LOSS AND OPTIMUM REFLECTIVITY OF OUTPUT  
MIRROR IN RUBY LASER WITH EXTERNAL MIRROR  
A66-25187

ANGULAR DISTRIBUTION OF STIMULATED RAMAN  
RADIATION, DISCUSSING AXIAL AND OFF-AXIAL STOKES  
AND SURFACE RADIATION MECHANISM  
A66-25189

OPTICAL RESONATOR DIFFRACTION LOSS, NOTING LASER  
OSCILLATIONS IN HIGH LOSS ARRANGEMENTS, OUTPUT  
BEAM POWER, FIELD PATTERNS, ETC  
A66-25195

LASER PRODUCING TWO OR THREE LIGHT PULSES IN  
SEQUENCE WITH INTERVAL BETWEEN PULSES MECHANICALLY  
CONTROLLED BY OPTICAL WEDGE INSERTED INTO  
RESONATOR A66-25322

ADJUSTMENT PROCEDURE FOR LASER WITH POLYGONAL  
RESONATOR, NOTING SPATIAL MIRROR ADJUSTMENT IN  
ADDITION TO ANGULAR ADJUSTMENT A66-25323

EFFECTIVE DIFFUSION CROSS SECTION OF ULTRASONIC  
AND LASER BEAM WHILE ACTING ON TURBULENT FLOW  
A66-25404

IR LASER RADIATION WITH POWER OF 5.7 WATTS IN  
VICINITY OF 10.69 MU IN SEALED TUBE CONTAINING  
PURE CARBON DIOXIDE EXCITED BY AC OR DC CURRENT

- SECOND HARMONIC GENERATED BY TRANSMITTING LASER RADIATION THROUGH TELLURIUM MONOCRYSTAL, WHILE FILTERING OUT FUNDAMENTAL FREQUENCY A66-25410
- OPTICAL EXCITATION IN INDIUM ARSENIDE AND GALLIUM ANTIMONIDE YIELDING LASER RADIATION A66-25437
- ENERGY SPECTRA OF IONS EMITTED BY BERYLLIUM, CARBON AND MOLYBDENUM HEATED BY LASER A66-25438
- NEODYMIUM DOPED YAG CRYSTAL AND LITHIUM META NIOBATE AS CW LASER MATERIALS AND POTASSIUM TANTALUM NIOBATE AS OPTICAL MODULATOR MATERIAL A66-25479
- OPTICAL RAY TRACING TO PREDICT FOCUSING CHARACTERISTICS OF LASER LIGHT IN REFRACTIVE TARGETS, CALCULATING HEATING EFFECTS IN TARGET, NOTING TARGET GEOMETRY, REFRACTIVE INDEX, THICKNESS OF SKIN LAYERS, ETC A66-25518
- COHERENT LIGHT RECORDING/REPRODUCING TECHNIQUES BASED ON DEBYE THEORY OF COHERENT LIGHT SOURCE FOCUSING A66-25531
- OUTPUT POWER OF 6328 ANGSTROM HE- NE GAS LASER AS FUNCTION OF LASER GAIN, CAVITY LOSS AND OUTPUT COUPLING A66-25541
- ALIGNMENT OF LASER MIRRORS USING GAS LASER WITH HIGHLY COLLIMATED BEAM OF SMALL DIAMETER A66-25651
- GALLIUM ARSENIDE P-N JUNCTION LASER DIODE, INJECTION CURRENT DISTRIBUTION, DENSITY AND EMISSION SPECTRA VARIATION A66-25824
- SENSITIVITY AND TRACKING CAPABILITIES OF PRECISION LASER AUTOMATIC TRACKING SYSTEM A66-25934
- LASER PUMPING BY INTENSE NOBLE GAS DISCHARGE IN ZETA-PINCH GEOMETRY A66-25984
- SPECTROSCOPY OF LITHIUM FLUORIDE CRYSTALS ACTIVATED WITH URANIUM TRIOXIDE FOR LASER ACTION, SHOWING ANOMALOUS FLUORESCENT DECAY UNDER HIGH INTENSITY PUMPING A66-25995
- ELLIPTIC CAVITY DESIGN FOR SOLID STATE LASERS, DISCUSSING MULTIPLE REFLECTIONS, ABSORPTION COEFFICIENT, REFRACTION LOSSES, ETC A66-25997
- OPTICAL LENGTH VARIATIONS IN LASER AMPLIFIERS DETERMINED DURING PUMPING AND AMPLIFICATION, USING INTERFEROMETRY A66-25998
- PHOTOGRAPHIC COPIES OF HOLOGRAMS TAKEN WITH LASER LIGHT NOTING FILM, LIGHT SOURCE, DIRECTIONAL EFFECT, PROCESSING, ETC A66-25999
- MICROWAVE MODELS OF OPTICAL RESONATORS, DISCUSSING CORRECTION OF DISCREPANCIES RESULTING FROM APPROXIMATIONS IN MEASUREMENTS A66-26000
- AMPLIFICATION OF INTERACTION OF ATOMS AND OF PULSED OR PERIODIC COOLING OF TRANSPARENT MEDIA PRODUCED BY LASER BEAM, NOTING CHANGES IN KINETIC ENERGY OF ATOMS A66-26006
- AUTOMODULATION OF EMISSION FROM SOLID STATE LASER A66-26021
- HELIUM-NEON LASER MULTIBEAM GENERATION IN GAS DISCHARGE TUBE, USING SPHERICAL MIRRORS AND TAPERED PLATES A66-26041
- MAGNETIZATION INDUCED BY CIRCULARLY POLARIZED LASER LIGHT INCIDENT ON NONABSORBING MATERIAL, IN ABSENCE OF EXTERNAL MAGNETIC FIELD, IN DOPED CALCIUM FLUORIDE PROPORTIONAL TO LIGHT INTENSITY AND VERDET CONSTANT A66-26053
- SECOND HARMONIC GENERATION OF LIGHT ANALYZED, STRESSING SATURATION EFFECTS OCCURRING AT HIGH LASER POWER, SOLVING NONLINEAR MAXWELL EQUATIONS A66-26142
- LIGHT FREQUENCY MULTIPLIERS FOR NONLINEAR OPTICAL EFFECTS AT VARIOUS WAVELENGTHS, CONSIDERING FOCUSING, LASER BEAM FINITE DIVERGENCE, AIR BREAKDOWN, STIMULATED RAMAN EMISSION, ETC A66-26144
- NONLINEAR LIGHT SCATTERING IN PRESSURIZED METHANE, NOTING DISPLACEMENT OF SPECTRAL LINE FROM LASER FREQUENCY A66-26146
- NONLINEAR SUSCEPTIBILITY DESCRIBING SECOND HARMONIC GENERATION OF LIGHT MEASURED IN SEMICONDUCTORS WITH ZINC-BLENDE SYMMETRY, USING QUANTUM MECHANICS AND LASER WAVELENGTH A66-26148
- CROSS SECTION FOR INELASTIC SCATTERING OF ELECTROMAGNETIC RADIATION BY ELECTRON DENSITY FLUCTUATIONS IN ANISOTROPIC SOLIDS, USING LASER SOURCES, INVESTIGATING LANDAU AND COLLISION DAMPING OF PLASMONS A66-26149
- SCATTERING OF ELECTRON BEAM BY STANDING WAVES OF PHOTONS INSIDE LASER CAVITY CORRESPONDS TO STIMULATED COMPTON EFFECT A66-26153
- EFFECT OF FLUCTUATING LASER PUMP ON STIMULATED RAMAN SCATTERING, NOTING GROWTH OF COUPLED STOKES-ANTI-STOKES WAVES IN PRESENCE OF TWO-MODE PUMP A66-26155
- ABSORPTION SPECTRA IN OPTICAL REGION WHEN LASER RADIATION AND CONTINUOUS RADIATION ARE SIMULTANEOUSLY INCIDENT ON MOLECULAR MEDIUM A66-26158
- INTERACTION BETWEEN STIMULATED BRILLOUIN AND RAMAN SCATTERING IN CARBON SULFIDE, USING OPTICAL RESONATOR AND LASER BEAM A66-26161
- VELOCITY AND LIFETIME OF MICROWAVE THERMAL PHONONS IN LIQUIDS AND SOLIDS DETERMINED BY SPECTRUM OF LIGHT SCATTERING FROM LASER ILLUMINATED SAMPLE A66-26162
- EXCITATION RADIATION TRANSFER FROM TRIVALENT CHROMIUM TO NEODYMIUM EXAMINED VIA FLUORESCENCE SPECTROSCOPY, NOTING ENERGY TRANSFER PARAMETERS AND EFFECT ON LASER OUTPUT A66-26166
- PHOTOLUMINESCENCE AND STIMULATED EMISSION OF GALLIUM ARSENIDE AND INDIUM ANTIMONIDE OBTAINED BY OPTICAL PUMPING, NOTING EFFECT OF APPLIED MAGNETIC FIELD ON LASER AND DIODE EMISSIONS A66-26175
- STEADY STATE VARIATION OF LIGHT INTENSITY WITH DISTANCE FOR MONOCHROMATIC LIGHT, NOTING DEPENDENCE OF ABSORPTION COEFFICIENT ON DEGREE OF EXCITATION OF ELECTRONIC SYSTEM A66-26182
- ELECTRICAL BREAKDOWN OF GASES BY OPTICAL FREQUENCY RADIATION, NOTING LASER BEAM ATTENUATION AND SUBSEQUENT ENERGY ABSORPTION BY PLASMA A66-26183
- GROWTH RATE OF IONIZATION BY ELECTRON IMPACT IN PRESENCE OF LASER BEAM, ELASTIC AND INELASTIC SCATTERING CROSS SECTIONS, FREE-FREE ABSORPTION, EXCITATION AND IONIZATION COEFFICIENTS, BREAKDOWN TIMES AND THRESHOLDS A66-26190
- PRESSURE EFFECTS IN FABRY-PEROT LOSSY-CAVITY GAS LASER OUTPUT A66-26199
- THRESHOLD STUDIES OF ION LASER OSCILLATIONS IN SULFUR AND SATURATION AND QUENCHING OF LASER INTENSITY A66-26209
- OPTICAL SYSTEM FOR SCHLIEREN RECORDING, DEFLECTION MAPPING, SHADOWGRAPHY AND INTERFEROMETRY ACHIEVED FOR LASER LIGHT, USED IN RECORDING OF REFRACTIVE INDEX FIELDS A66-26307



MAGNITUDE AND PHASE OF COMPLEX SPATIAL COHERENCE  
OF HE- NE LASER BEAM A66-26334

HELIUM-NEON LASER EMISSION ON 6401 ANGSTROM LINE,  
NOTING INTENSITY VS MIRROR SHIFT AND OPTICAL  
CAVITY INSTABILITY A66-26336

SELF-PUMPING CHEMICAL LASER THEORY AND OPERATION,  
NOTING CHEMICAL PUMPING A66-26382

COOLER FOR SEMICONDUCTOR LASERS AND PHOTODETECTORS  
USING LOW TEMPERATURE GAS A66-26559

ALIGNMENT OF ANGULAR POSITIONS OF SPHERICAL MIRROR  
AND GRATING OF FASTIE- EBERT SPECTROMETER, USING  
BRIGHT COLLIMATED MONOCHROMATIC BEAM OF HE- NE  
LASER A66-26564

MAXIMUM OUTPUT POWER APPROXIMATED FOR 6328  
ANGSTROM HE- NE GAS LASER, NOTING OPTIMUM MIRROR  
TRANSMISSION AND LASER GEOMETRY A66-26571

MATHEMATICAL MODEL OF GA AS INJECTION LASER  
APPLIED IN DETERMINING MAXIMUM OBTAINABLE POWER  
OUTPUT, USING RATE EQUATIONS OF ELECTRON AND  
PHOTON DENSITIES AND THERMAL RESISTANCE FOR  
OPTIMUM VALUE A66-26572

CATAPHORESIS, MOVING STRIATIONS AND ASSOCIATED  
NOISE IN HE- NE LASER A66-26591

I R AND VISIBLE HELIUM-NEON LASER MODULATION USING  
FARADAY ROTATION IN YIG A66-26881

LASER OSCILLATIONS IN CD SE AND CD S BOMBARDED  
BY FAST ELECTRON BEAM A66-27031

LASER DOPPLER VELOCIMETER FOR MEASURING LOCALIZED  
FLOW VELOCITIES IN LIQUIDS A66-27053

RUBY LASER ENERGY REFLECTED OFF EXPLORER XXII  
SATELLITE A66-27054

LASER RADIATION COHERENCE PROPERTY DETERIORATION  
AND MOLECULAR SCATTERING DURING PROPAGATION  
THROUGH TURBULENT ATMOSPHERE A66-27131

EFFECT OF LONGITUDINAL MAGNETIC FIELD ON OUTPUT  
POWER OF GAS LASER OPERATING IN IR SPECTRUM,  
NOTING GAS-MIXTURE PRESSURE IN DISCHARGE TUBE ROLE  
A66-27156

SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-  
PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION  
A66-27187

PUMPING NEODYMIUM LASERS THROUGH USE OF COHERENT  
EMISSION OF RUBY LASERS, FINDING THRESHOLD ENERGY  
A66-27605

ENERGY-RICH PLASMAS PRODUCED BY LIGHT PULSES FROM  
Q-SWITCHED LASER, NOTING ENERGY TRANSFER FROM  
ELECTRONS TO IONS DURING EXPANSION PROCESS  
A66-27607

TIME PARAMETERS OF POWERFUL LASER MEASURED WITH  
GA AS PHOTODIODE, NOTING TIME CONSTANT AND TIME  
RESOLUTION OF PHOTODIODE A66-27750

LASER SAFETY STANDARDS, DISCUSSING NATURE OF  
PHOTOBIOLOGICAL MECHANISMS RESPONSIBLE FOR TISSUE  
DAMAGE UPON EXPOSURE TO LASER RADIATION  
A66-27775

FLUORESCENT LIFETIMES OF NEODYMIUM, YTTERBIUM AND  
SAMARIUM INCORPORATED IN ORDERED PEROVSKITE-TYPE  
COMPOUNDS DETERMINED, NOTING CRYSTAL STRUCTURE  
POTENTIAL FOR LASER EMISSION A66-27976

PERFORMANCE OF TWO-PHOTON LASER OPERATING IN  
CONTINUOUS WAVE MODE, DERIVING FORMULA FOR PULSE  
FREQUENCY A66-28166

ELECTROSTATIC PROBE MEASUREMENTS OF VELOCITY  
DISPLACEMENT AND ELECTRON DENSITY OF PLASMA USING  
LASER COMPARED WITH MEASUREMENTS USING MICROWAVE  
INTERFEROMETER A66-28269

MEASUREMENTS OF MASER BEAM PROPAGATED THROUGH  
ATMOSPHERE, EMPHASIZING BEAM BROADENING AND SIGNAL  
FLUCTUATION DUE TO CLEAR AIR TURBULENCE A66-28581

ATMOSPHERIC EXPLORATION WITH LIDAR, NOTING HIGH  
RESOLUTION AND SENSITIVITY A66-28600

LIGHT TRANSMISSION THROUGH OPTICAL DIFFRACTION  
LATTICE CONSISTING OF MEDIUM IN EM FIELD OF  
LASER BEAM A66-28626

ELECTRON DENSITY IN LASER-INDUCED SPARK IN AIR  
DETERMINED, MEASURING SIMULTANEOUSLY FUNDAMENTAL  
LASER WAVELENGTH AND SECOND HARMONIC A66-28685

COHERENT EMISSION FROM TRIVALENT HOLMIUM IONS IN  
RARE EARTH SUBSTITUTED YTTRIUM ALUMINUM GARNET,  
NOTING THREE ENERGY TRANSFER COMBINATIONS IN YAG  
A66-28690

MEASUREMENT OF SINGLE LINE IN P BRANCH OF CARBON  
DIOXIDE VIBRO-ROTATIONAL ABSORPTION BAND USING  
TUNED OPTICAL MASER SPECTROSCOPY, NOTING PRESENCE  
OF SHIFTED FREQUENCIES A66-28691

RADIATIVE CASCADE PATTERNS IN HELIUM-NEON GAS  
SYSTEM USING IDEALIZED MODEL, COMPUTING  
SPONTANEOUS DECAYS WHICH ARE COMPARED WITH LASER  
EXPERIMENTS A66-28699

TEMPERATURE SHIFT OF RUBY LASER EMISSION MEASURED  
INTERFEROMETRICALLY FOR TEMPERATURES BETWEEN 66  
AND 210 DEGREES K A66-28701

DAMAGE THRESHOLDS FOR VARIOUS GLASSES EXPOSED TO  
LASER PULSES, EMPHASIZING INTERNAL DAMAGE A66-28732

INTENSITY DISTRIBUTION AT FOCUS OF HIGH POWER  
LASER, NOTING MEASURING METHOD A66-28834

GAS LASER OUTPUT WAVELENGTH STABILIZATION BY USE  
OF EXTERNAL PASSIVE OPTICAL INTERFEROMETER  
A66-28835

PULSED TOROIDAL EXCITATION OF GAS ION LASERS  
EXTENDED TO DRIVE HIGH POWER CW LASER TRANSITIONS  
IN AR, KR, CL AND BR, NOTING OPERATING  
PARAMETERS AND POWER OUTPUT A66-28877

C W IR LASER OSCILLATION IN ATOMIC CL IN H CL  
AND HI GAS DISCHARGES, NOTING USE OF TWO POWER  
SUPPLIES AND ENERGY LEVEL DIAGRAM A66-28880

STIMULATED RAMAN EFFECT IN ACETONE AND ACETONE-  
CARBON DISULFIDE MIXTURES, NOTING SIMILARITY OF  
STOKES RADIATION PATTERN TO RAMAN EFFECT  
A66-28881

DEPENDENCE OF MAGNITUDE OF HERSCHEL BLEACHING IN  
PHOTOGRAPHIC EMULSION ON DELAY BETWEEN FORWARD AND  
BLEACHING EXPOSURE, USING LASER RADIATION  
A66-28884

118-MICRON WAVELENGTH WATER VAPOR GAS LASER WITH  
4-INCH DIAMETER TWO-METER FOCAL LENGTH MIRROR  
RESONATOR SYSTEM A66-29010

SURFACE TEMPERATURE DETERMINATION PROCEDURE FOR  
LASER HEATED METALS BASED ON HEAT CONDUCTION  
EQUATIONS AND ION EMISSION FROM SURFACE  
A66-29035

RESONATOR GEOMETRY AND MIRROR POSITIONS AND EFFECT  
ON RADIATION OUTPUT IN HELIUM-NEON LASER  
A66-29201

SPECTRAL COMPOSITION OF LASER LIGHT WITHIN  
FRAMEWORK OF THEORY OF NONLINEAR OPTICAL EFFECTS  
A66-29356

RELATION BETWEEN LASER PARAMETERS AND CATHODE  
DIAMETER IN EXCITATION OF HE- NE MIXTURE BY  
DISCHARGE OF HOLLOW CYLINDER A66-29357

HOLE BURNING IN BLEACHABLE ABSORBERS USED AS LASER

- Q-SPOILER A66-29387
- LASER OSCILLATION WITH TOTALLY REFLECTING ROOF PRISM AS CAVITY, NOTING OUTPUT VS MIRROR ALIGNMENT FOR TWO ROTATION AXES A66-29414
- PULSED LASER OPERATION IN WEDGE-SHAPED RUBY ROD AT ROOM TEMPERATURE A66-29415
- NEON LEVEL BROADENING UNDER EFFECT OF LASER RADIATION STUDIED BY OBSERVING HANLE EFFECT ON FLUORESCENT LIGHT A66-29640
- DETECTION OF VERY LOW LEVELS OF MODULATION ON LASER BEAM TO DETERMINE PERFORMANCE OF MICROWAVE LIGHT MODULATORS A66-29682
- MEASURING DEVICE FOR PULSED LASER OUTPUT POWER USING BOLTOMETER, AMPLIFIER AND OSCILLOSCOPE A66-29701
- DYNAMICS OF FIELD AND GENERATION FREQUENCIES IN GIANT PULSE OF RUBY LASER WITH PASSIVE SHUTTER, USING SOLUTION OF CRYPTO CYANINE IN ETHANOL, NOTING MIRROR REFLECTION COEFFICIENT A66-29727
- OUTPUT POWER FREQUENCY RESPONSE OF SINGLE MODE HELIUM NEON LASER, DETERMINING EFFECTS OF ATOMIC COLLISIONS ON FREQUENCY RESPONSE OF INDIVIDUAL ATOMS A66-29812
- STATISTICAL ANALYSIS OF LIGHT FIELDS CREATED BY SUPERPOSITION OF LASER LIGHT AND CHAOTIC LIGHT A66-29815
- SECOND HARMONIC GENERATION / SHG/ BY FOCUSED LASER BEAMS IN NONLINEAR CRYSTALS A66-29816
- COUPLING AND SYNCHRONIZATION OF LASERS, NOTING FIELD AMPLITUDES, DELAYED INTERACTION AND DIELECTRIC CONSTANT DISPERSION A66-29885
- PROPAGATION RATE OF HIGH POWER LASER LIGHT PULSE IN INVERSELY POPULATED MEDIUM A66-29980
- COOPERATIVE INTERACTIONS BETWEEN IONS AND ELECTRONS IN FORWARD SCATTERING OF RUBY LASER BEAM FROM PLASMA A66-30153
- UNMODULATED LASER OUTPUT AT CONTROLLED FREQUENCY, USING CORRECTING BEATS FROM REFERENCE LASER A66-30205
- TRAVELING WAVE BEATS CREATED BY RING LASER ON ROTATING PLATFORM, NOTING FREQUENCY DIVISION ROTATING RATE AND CAPTURE BAND PARAMETERS A66-30281
- FREQUENCY SHIFT IN RESONANCE TRANSITION INDUCED IN POTASSIUM VAPOR BY RUBY LASER PULSE A66-30282
- LASER ACTION WITH NONRESONANT FEEDBACK USING HIGH GAIN RUBY CRYSTALS A66-30297
- WRITING RATE OF ROTATING-MIRROR STREAK CAMERA DETERMINED, USING Q-SWITCHED LASER TECHNIQUE A66-30419
- TOPOCENTRIC DISTANCE OF GEODETIC SATELLITE GEOS-A MEASURED BY LASER TELEMETRY FROM STATION A66-30586
- DEMODULATION METHOD IN WHICH PHASE MODULATION OF LASER BEAM IS CONVERTED TO AMPLITUDE MODULATION BY AUTOCORRELATION A66-30616
- RADIATIVE CORRECTIONS TO THOMSON SCATTERING IN LASER BEAMS ARISING FROM DAMPING OF ELECTRON MOTION AND PHOTON DENSITY, USING QUANTUM MECHANICS A66-30628
- HIGH SPEED STROBOSCOPIC PHOTOGRAPHY USING KERR CELL MODULATED LASER SOURCE A66-30828
- SECOND HARMONIC GENERATION BY LASER BEAMS OF FINITE SPECTRAL WIDTH, USING QUANTUM TRANSITIONS AND KINETIC EQUATIONS, NOTING SHAPE OF PUMPING LINE AT FUNDAMENTAL FREQUENCY A66-30845
- DEGREE OF EXCITATION OF METASTABLE STATE DETERMINED, USING LUMINESCENCE SATURATION PHENOMENON, CALCULATING POPULATION OF WORKING LEVEL OF LASER SUBSTANCE A66-30846
- MEASUREMENT OF RADIATION PATTERN OF RUBY LASER EMISSION FOR VARIOUS RESONATORS AND OPERATING REGIMES, NOTING LASER EFFECT ON ANGULAR HALF-WIDTH VALUES A66-30847
- BREAKDOWN BY NEODYMIUM GLASS LASER RADIATION IN ATOMIC AND MOLECULAR GASES, DETERMINING POWER DENSITIES, NOTING RELATION OF PRESSURE TO BREAKDOWN POWER A66-30938
- DISLOCATIONS AND PRECIPITATES IN GA AS INJECTION LASERS REVEALED BY NEW A-B ETCHANT A66-31071
- COLLISION BROADENED LINewidth AND SATURATION PARAMETERS FOR 6328 ANGSTROM TRANSITION OF NE IN HE- NE LASER A66-31084
- TIME RESOLUTION OF LASER-INDUCED ELECTRON EMISSION FROM CESIUM DIODE AT HIGH LASER POWER A66-31135
- STATISTICAL EFFECTS DURING GENERATION OF SECOND HARMONIC IN OPTICALLY TRANSPARENT CRYSTALS, NOTING COEFFICIENT OF CORRELATION BETWEEN HARMONIC AND FUNDAMENTAL RADIATION POWER OF SOLID STATE LASER A66-31167
- RECORDING OF LIGHT-INDUCED LIGHT SCATTERING USING LASER BEAM, CALCULATING CROSS SECTION OF PHOTON-PHOTON SCATTERING A66-31175
- GIANT COHERENT LIGHT PULSE GENERATION BY Q-FACTOR-MODULATED LASER A66-31183
- INITIAL PULSE IN LUMINOUS EMISSION OF DISCHARGE LASER, USING PHOTOMULTIPLIER PRECEDED BY MOBILE IRIS, DETERMINING GEOMETRICAL DISTRIBUTION OF DISCHARGE BRIGHTNESS A66-31209
- LASER BEAM ENERGY PROFILE DETERMINED BY MULTIPLE-LAYER ALUMINUM FOIL TECHNIQUE A66-31217
- EFFECTS AND PARAMETERS INFLUENCING OPTICAL PATH LENGTH WITHIN PUMPING PROCESS IN RUBY AND DOPED GLASS LASER RODS A66-31443
- HIGH VOLTAGE PULSED ELECTRODELESS DISCHARGE IN RARE GAS AS LIGHT SOURCE FOR RUBY AND NO GLASS LASER EXCITATION AND OBSERVATION OF OUTPUT CHARACTERISTICS A66-31448
- LASER CAVITY OUTPUT OPTIMIZATION FOR MAXIMUM EXTERNAL QUANTUM EFFICIENCY SHOWING DEPENDENCE ON LENGTH AND REFLECTIVITY FOR GIVEN CURRENT DENSITY A66-31535
- LASER INDUCED SPONTANEOUS ELECTRON EMISSION FROM REAR SIDE OF METAL FOILS, NOTING ELECTRON ENERGY VS LASER ENERGY PULSE MAGNITUDE, ETC A66-31536
- GRANULARITY CHARACTERISTICS OF SCATTERED LIGHT FROM HELIUM-NEON LASER DIRECTED ONTO MOVING SURFACE A66-31725
- NEAR-FIELD DIFFRACTION OF HELIUM-NEON LASER AT CIRCULAR APERTURES A66-31727
- LASER BEAM EFFECT ON HARDENING OF STEEL A66-31802
- BREAKDOWN OF GASES UNDER INFLUENCE OF LASER SPARK PHENOMENA WITH SUBSEQUENT ABSORPTION OF LASER RADIATION AND GAS HEATING A66-32061
- STATIC CHARACTERISTICS OF GAS LASER INTERNAL MODULATION CIRCUIT, USING ELECTRO-OPTICAL CRYSTAL INSERTED INTO GAS LASER RESONATOR A66-32225
- LASER AND MASER DEVELOPMENT, DISCUSSING DESIGN IMPROVEMENTS AND APPLICATION FOR TELEVISION, SPACE COMMUNICATIONS, ETC A66-32353

NONLINEAR SCATTERING OF RUBY LASER BEAM BY PLASMA  
AT SECOND AND THIRD HARMONIC A66-32433

SUN PUMPED CONTINUOUS WAVE ONE-WATT YAG CRYSTAL  
LASER, NOTING EQUIPMENT SETUP AND OUTPUT DURATION  
A66-32620

INTERNAL PHASE MODULATION IN HE- NE LASER USING  
ELECTRO-OPTIC EFFECT IN CRYSTAL QUARTZ, OBSERVING  
SPECTRUM AND RF MODE BEATS A66-32621

FREQUENCY SHIFT RELATIVE TO SPECTRAL WIDTH FOR  
SINGLE PULSES OF TRIGGERED LASER DETERMINED BY  
MEASURING VARIATIONS OF EMITTED WAVELENGTH AS  
FUNCTION OF TIME A66-32622

STIMULATED BRILLOUIN SCATTERING FROM NITROGEN AND  
METHANE USING GIANT PULSE LASER, NOTING  
CONVERGENCE ANGLE OF BACKSCATTERED BEAM SOUND,  
VELOCITY MEASUREMENT, ETC A66-32627

HEAT TRANSFER AND STRESS WAVE EVOLUTION PRIOR TO  
ABLATION AND THERMAL EQUILIBRIUM IN EXPOSURE OF  
SOLID AND LIQUID MATERIALS TO LASER SOURCES  
A66-32638

INTENSITY NOISE IN MULTIMODE GA AS LASER EMISSION  
A66-32689

POWER ENHANCEMENT IN PULSED HE- NE LASERS, NOTING  
OVERSHOOTING FOR RF DISCHARGE MODULATION WITH  
SQUARE WAVE A66-32963

RESONATOR GEOMETRY AND MIRROR POSITIONS AND EFFECT  
ON RADIATION OUTPUT IN HELIUM-NEON LASER  
A66-33050

STRONG AXIAL MAGNETIC FIELD EFFECT ON CONSTANT  
CURRENT DISCHARGE IN CONTINUOUS-DUTY ION LASER,  
NOTING PLASMA DIFFUSION, CHARGED PARTICLE DENSITY  
AND LASER OUTPUT DECREASE A66-33117

ION LASERS INVOLVING ELECTRON TRANSITIONS IN ATOMS  
OR MOLECULES WITH LOST ELECTRONS  
A66-33249

FAR IR RADIATION DETECTED AT VISIBLE FREQUENCY,  
USING NONLINEAR OPTICAL MIXING WITH LASERS  
A66-33322

LOW THRESHOLD NEODYMIUM GLASS LASER OSCILLATOR  
WITH HIGH REPETITION A66-33325

HIGH POWER CONTINUOUS WAVE FOUR-LEVEL SOLID  
NEODYMIUM GLASS LASER SHOWING LENGTH AND MOST LOSS  
AS DOMINANT FACTORS IN LIMITING OUTPUT POWER  
A66-33334

EXPERIMENTAL STUDY OF EMISSION CONTROL IN RUBY  
LASER USING DIFFRACTION MODULATOR WITH MODULATED  
TRAVELING ULTRASONIC WAVE A66-33516

OPTICAL MODULATION IN BULK GALLIUM ARSENIDE, USING  
GUNN EFFECT A66-33606

IONIZED NOBLE GAS LASERS, CONSIDERING PROBLEMS AT  
HIGHER POWERS, ESPECIALLY THOSE OF INVERSION  
MECHANISM AND MAGNETIC FIELD EFFECTS  
A66-33767

COMMUNICATION SYSTEMS AT MICROWAVE AND OPTICAL  
FREQUENCIES FOR FUTURE MARS MISSIONS  
A66-33793

ACQUISITION AND REACQUISITION IN SPACECRAFT-  
SPACECRAFT AND SPACECRAFT-TO- EARTH COMMUNICATIONS  
USING LASER SYSTEMS A66-33795

QUALITATIVE RESULTS ON TRANSPORT MECHANISMS  
AROUND DROPPING MERCURY ELECTRODE, USING LONG PATH  
LASER INTERFEROMETRY A66-33924

PHOTOCONDUCTIVITY INDUCED IN UNCOLORED SODIUM  
CHLORIDE AND ALUMINUM OXIDE SINGLE CRYSTALS BY  
RADIATION FROM RUBY LASER A66-33939

RUBY PHOTOCONDUCTIVITY WHEN EXPOSED TO LASER  
IRRADIATION, NOTING OSCILLOGRAMS  
A66-33941

LASER ACTION ON SEVERAL HYPERFINE TRANSITIONS IN  
MN I A66-34000

COHERENT AND SPONTANEOUS EMISSION FROM LEAD-TIN  
TELLURIDE ALLOYS UPON EXCITATION BY GA AS DIODE  
LASER, NOTING BAND STRUCTURE OF ALLOY SYSTEM  
A66-34159

LASER REGIME WITH GIANT PULSES GENERATED IN  
DYSPROSIUM DOPED CADMIUM FLUORIDE UNDER CONTINUOUS  
PUMPING BY XENON LAMPS, OBTAINING Q FACTOR  
MODULATION BY ROTATING PRISM A66-34178

NE- HE LASER OUTPUT DEPENDENCE ON PRESSURE AND  
NONEXCITED ATOM CONCENTRATION A66-34696

ENERGY AND POWER OF Q-SWITCHED NEODYMIUM GLASS  
LASER MEASURED, USING CALORIMETRIC DEVICES,  
VACUUM PHOTODIODES, ETC A66-34904

SOVIET AND FOREIGN PAPERS ON PLASMA DIAGNOSTICS  
BY SCATTERING OF LASER BEAMS AT PLASMA ELECTRONS  
A66-34967

HOLOGRAPHY PRINCIPLES AND DEVELOPMENT, CONSIDERING  
WAVE FRONT RECONSTRUCTION, LIPPMANN PHOTOGRAPHY,  
LASER LIGHT, APPLICATION TO TV, ETC  
A66-35244

OUTPUT POWER OF CW LASER MEASURED BY WIRE  
BOLOMETER IN FORM OF PLANE SINGLE-LAYER SPIRAL AS  
SENSITIVE ELEMENT A66-35321

HELIUM-NEON LASER ASSESSMENT AS SOURCE IN HIGH  
PRECISION RANGE MEASUREMENTS A66-35362

LIGHT ENERGY MEASUREMENTS MADE WITH ARGON BOMB  
USED AS CHEMICALLY POWERED LASER PUMP  
A66-35388

CW HE- NE LASER MEASUREMENT OF LIGHT SCATTERING  
IN CRYSTALS NOTING LASER OUTPUT, PERFORMANCE AND  
CRYSTAL IMPERFECTIONS A66-35402

ORIENTATION EFFECT IN GA AS INJECTION LASERS,  
NOTING EMISSION CHARACTERISTICS AND STRUCTURAL  
SPECTRA A66-35404

LASER ACTION IN CLOSED MOLECULAR SYSTEM WITH  
MIXTURE OF CARBON DIOXIDE, NITROGEN AND WATER  
VAPOR, NOTING COUPLING-OUT PLATE REFLECTIVITY AND  
POPULATION INVERSION A66-35433

LASER ILLUMINATED ELECTRO-OPTICAL IMAGING NOTING  
ENERGY VARIATION PARAMETERS, EQUIPMENT USED AND  
RESULTS OBTAINED IN TV RECEPTION  
A66-35531

MULTICOLOR LASER DISPLAY, DISCUSSING COMPONENTS  
AND FUTURE APPLICATION A66-35532

RING LASER SENSOR PARAMETERS AND CHARACTERISTICS,  
NOTING APPLICATION TO MEASUREMENT OF ANGULAR RATE,  
MASS FLOW, NAVIGATION AND GUIDANCE  
A66-35533

SPATIAL COHERENCE MEASUREMENT OF HE- NE LASER  
OUTPUT A66-35592

LASER APPLICATION FOR VIBRATION MEASUREMENT  
UTILIZING DOPPLER SHIFT PRODUCED ON WAVE  
REFLECTED FROM SURFACE VIBRATING NORMAL TO BEAM  
PATH A66-35673

GALLIUM ARSENIDE LASER EXCITATION BY FAST  
ELECTRONS A66-35760

LASER APPLICATION SURVEY A66-35798

PLASMA DENSITY USING LASER BASED INTERFEROMETER,  
INTERPRETING PHASE SHIFT OF LASER SIGNAL AS TIME  
DEPENDENT LASER FREQUENCY VARIATION  
A66-35817

LASER OUTPUT ENERGY CONTROLLER HAVING EIGHT-TO-ONE  
IMPROVEMENT IN PULSE REPEATABILITY IN SOLID STATE  
LASERS A66-36034

VALENCE BAND SPIN-ORBIT SPLITTING IN HIGHLY

DEGENERATE SEMICONDUCTORS DETERMINED FROM SPLITTING OF PEAK LASER DIODE EMISSION IN HIGH MAGNETIC FIELDS A66-36036

RESONANT BIREFRINGENCE IN POTASSIUM VAPOR UNDER INFLUENCE OF ELECTRIC FIELD OF RUBY LASER EMISSION A66-36066

GALLIUM ARSENIDE LASERS OPERATING AT ROOM TEMPERATURE INVESTIGATED, BASED ON DIFFUSION P-N JUNCTIONS, DISCUSSING EMISSION SPECTRUM A66-36070

PULSED DISCHARGES OF OCS MOLECULAR LASER A66-36080

MEASUREMENTS ON PHYSICAL AND LASER PROPERTIES OF VAPOR-GROWN RUBY SINGLE CRYSTALS PREPARED BY EPITAXIAL GROWTH A66-36081

COHERENT LASER-TYPE LIGHT GENERATORS WITH CAPABILITY OF ADJUSTING FREQUENCY OVER VISIBLE SPECTRUM A66-36265

PLASMA PRODUCTION BY FIRING GIANT PULSE LASER AT SOLID DEUTERIUM PELLET /ICE/, NOTING STRONG ANISOTROPY IN PLASMA OUTBURST A66-36595

HIGH TEMPERATURE HIGH-DENSITY PLASMA FROM SINGLE SOLID PARTICLE OF LITHIUM HYDRIDE SUSPENDED IN VACUUM, USING RUBY LASER IRRADIATION A66-36596

FAST OVERLAP OF MICROWAVE RADIATION BY IONIZATION AUREOLE OF SPARK IN LASER BEAM A66-36719

MULTIPHOTON IONIZATION OF KRYPTON AND ARGON BY RUBY LASER RADIATION MAY OCCUR BY ABSORPTION A66-36721

GATED LASER NIGHT-VIEWING SYSTEM, CALCULATING APPARENT ILLUMINANCE AS FUNCTION OF TARGET DISTANCE A66-36938

PULSED RUBY LASERS, CONSIDERING PUMPING AND THRESHOLD, OUTPUT, QUANTUM MECHANICS AND VARIATION ON BASIC DEVICE A66-36968

FREQUENCY SPECTRUM OF LASER IMPULSE IN Q-SWITCHING REGIME WIDER THAN THAT OF SINGLE IMPULSE RADIATED BY LASER IN ORDINARY REGIME A66-37141

SOLID LASER RADIATION OPERATING IN Q-SWITCHED RESONATOR REGIME NOTING EFFECT OF FINITE RATE OF SWITCHING, FINITENESS OF RELAXATION TIME, TRANSMISSION COEFFICIENT FACTOR, ETC A66-37142

TWO-PHOTON LASER EXCITATION CONDITIONS DETERIORATED BY PRESENCE OF RESONATOR TUNED ON TRANSITION FREQUENCY BETWEEN OPERATING LEVELS OF MATTER A66-37143

FREQUENCY DOUBLING IN RESONANCE LASER, OBTAINING SECOND HARMONIC FIELD FOR LASER RADIATION BY GIANT PULSES A66-37144

HIGH TIME RESOLUTION POLARIMETER FOR LASER ANALYSIS, BEAM INTENSITY AFTER PASSING THROUGH ANALYZERS MEASURED BY PHOTOMULTIPLIERS A66-37285

Q-SWITCHED RUBY LASER OUTPUT INCREASED BY USE OF SATURABLE DYE SOLUTION IN LASER CAVITY A66-37290

SPECTRAL COMPOSITION OF LASER LIGHT WITHIN FRAMEWORK OF THEORY OF NONLINEAR OPTICAL EFFECTS A66-37360

RELATION BETWEEN LASER PARAMETERS AND CATHODE DIAMETER IN EXCITATION OF HE- NE MIXTURE BY DISCHARGE OF HOLLOW CYLINDER A66-37361

GIANT PULSE FORMATION THEORY, MEASURING SHAPE AND DURATION OF NEODYMIUM GLASS LASER PULSES FOR VARIOUS VALUES OF INVERSE POPULATION A66-37367

CRYSTAL GROWTH, DIFFUSION AND FABRICATION OF GALLIUM ARSENIDE-PHOSPHIDE JUNCTION LASERS WITH LOW THRESHOLD CURRENT DENSITIES A66-37401

NONRECIPROCAL EFFECTS ASSOCIATED WITH EXCITATION CURRENT OBSERVED IN D C-EXCITED HE- NE RING LASER, NOTING COUPLING PHENOMENA BETWEEN RIGHT AND LEFT WAVES A66-37408

MAGNITUDE OF HANLE EFFECT OF NEON ATOMS EMITTED BY LASER DEPENDENCE ON EXCITATION DISCHARGE INTENSITY EXPLAINED BY MULTIPLE COHERENT DIFFUSION AT METASTABLE LEVEL A66-37409

OPTICAL TECHNIQUES IN LASER DETECTION SYSTEMS A66-37439

LASER EMISSION INTERFEROGRAMS OBTAINED WITH FABRY-PEROT CROSS-GRATING INTERFEROMETER IN SUBMILLIMETER WAVELENGTH RANGE A66-37546

SUBMILLIMETER LASER EMISSION FROM ICN NOTING INTERFEROGRAMS A66-37547

SINGLE CAVITY MICROWAVE LASER AMPLIFIER ANALYSIS, DETERMINING GAIN, BANDWIDTH, NOISE, CAVITY Q-FACTOR EFFECT AND WIDTH OF MAGNETIC RESONANCE LINE A66-37583

IDENTIFICATION OF NUMBER OF LINES AT 11 MICRONS EMITTED FROM PULSED CARBON DIOXIDE LASER AS P BRANCH OF CARBON DIOXIDE VIBRATIONAL TRANSITION A66-37629

NONLINEAR INTERACTION OF OSCILLATIONS OF TWO TYPES IN LASER DOES NOT EFFECT STATIONARY OPERATION WHEN OSCILLATIONS ARE SUFFICIENTLY APART IN BAND A66-37661

LASER TV SYSTEM OPERATION, PERFORMANCE CHARACTERISTICS AND APPLICATION A66-37743

PULSED OPERATION OF ELECTRON-BEAM PUMPED ZINC OXIDE LASER EMITTING RADIATION IN UV AT VERY LOW TEMPERATURES, NOTING IMPORTANCE OF USE OF CAVITY A66-37768

CONTINUOUS WAVE UV IONIZED GAS LASER EMISSION OVER FOUR TRANSITIONS IN NEON, KRYPTON AND ARGON A66-37771

UPPER LASER STATES DERIVING POPULATION THROUGH CASCADE TRANSITIONS FROM HIGHER LAYER STATES OF ARGON ION NOTING CONSISTENCY OF LASER OUTPUT CURRENT DEPENDENCE WITH CURRENT DEPENDENCE OF CASCADE RATE A66-37774

DEGRADATION OF CONTINUOUS ARGON LASER PERFORMANCE WHEN POSITIONED IN AXIAL MAGNETIC FIELD, NOTING ROLE OF QUENCHING, RADIATION TRAPPING AND EXCITATION MECHANISMS A66-37779

PHOTODISSOCIATION LASER SYSTEM, DISCUSSING OUTPUT ENERGY DEPENDENCE ON PRESSURE, TEMPERATURE AND NUMBER OF SUCCESSIVE OPTICAL PUMPING FLASHES A66-37781

SUBMILLIMETER WAVELENGTH ELECTRONIC DEVICES, EXAMINING DEVELOPMENT OF LASERS AND REFLECTED WAVE TUBES WITH OVERLAPPING EFFECTIVE WAVE RANGE A66-38004

STIMULATED EMISSION SPECTRUM IN AXIAL-MODE MODEL OF PLANE RESONATOR IN STATIONARY GENERATION REGIME A66-38127

TRAJECTORIES OF LIGHT RAYS THROUGH MEDIUM SUBJECTED TO ACOUSTIC WAVES EXAMINED KNOWING THAT ACOUSTIC WAVES IN LASER MEDIUM FUNCTION AS OPTICAL WAVEGUIDE A66-38238

DISCHARGE CURRENT AND LASER LIGHT NOISE MEASUREMENTS EFFECT IN GAS DISCHARGE HELIUM-NEON LASER, USING EQUIVALENT CIRCUIT A66-38240

FREQUENCY STABILIZATION OF GAS LASER TO LOCK

- OUTPUT TO CENTER OF ATOMIC RESONANCE, USING ERROR SIGNAL A66-38241
- HIGH POWER NONSPIKING OPERATION OF RUBY LASER FOR CONTINUOUS OUTPUT ON MICROSCOPIC AND MACROSCOPIC SCALE A66-38242
- CONFOCAL RESONATOR THEORY INSTEAD OF DIFFRACTION AS EXPLANATION OF 90 DEGREE ROTATION BETWEEN NEAR AND FAR FIELDS OF RUBY LASERS A66-38243
- SPONTANEOUS EMISSION NOISE POWER ADDED TO AMPLIFIED SIGNAL IN LASER AMPLIFIER IN HE- NE GAS DISCHARGE AND SATURATION RELATION TO POPULATION INVERSION A66-38387
- LASER MACHINING, DISCUSSING HOLE DRILLING, MICROWELDING METAL REMOVAL AND APPLICATION TO HARD BRITTLE MATERIALS ASME PAPER 66-MD-28 A66-38484
- UNFOCUSED RUBY LASER RADIATION FIELD-BIPHENYL COMPOUND INTERACTION, RESULTING LUMINESCENCE AND APPARENT MULTIPHOTON ABSORPTION A66-38528
- SECOND-HARMONIC GENERATION BY FOCUSED LASER BEAMS BASED ON EXPERIMENTS USING HE- NE GAS LASER, NOTING SHG SHOULD BE STRONGLY PEAKED WHEN FOCUS IS AT EITHER OF CRYSTAL SURFACES A66-38554
- FOKKER- PLANCK EQUATION APPLIED TO LASER UNDER INFLUENCE OF QUANTUM FLUCTUATIONS CONNECTED WITH DISSIPATION, PUMPING AND CAVITY THERMAL NOISE, NOTING DISTRIBUTION AND CORRELATION FUNCTION A66-38930
- PERFORMANCE OF GA AS SEMICONDUCTOR LASER WITH RESONATOR, NOTING DEPENDENCE OF FORBIDDEN ZONE WIDTH AND ABSORPTION COEFFICIENT ON FREE CARRIER CONCENTRATION AND INCIDENT PHOTON ENERGY A66-38955
- INTERCHANNEL GENERATION TRANSFER AND MULTICHANNEL GENERATION IN LASER WITH FOUR UNSPLIT LEVELS, NOTING RADIATION DENSITY, TEMPERATURE EFFECT AND VARIATIONS IN COEFFICIENTS OF LOSSES A66-38956
- MODULATION BY ULTRASONIC DIFFRACTION OF 10.6 MICRON LASER RADIATION IN PHOTOELASTIC CD S, GA AS AND SI CRYSTALS A66-39112
- OPTICAL SPECTRA OF ULTRASHORT OPTICAL PULSES GENERATED BY MODE-LOCKED GLASS-DOPED NEODYMIUM LASERS, CONSIDERING SATURABLE ABSORBER CELL PLACED PARALLEL TO FABRY- PEROT REFLECTOR A66-39115
- NEODYMIUM LASER OSCILLATOR USING TIME-VARIABLE REFLECTOR, NOTING LOADING AND DUMPING OF OPTICAL CAVITY WITH NEARLY MAXIMUM AMOUNT OF ENERGY A66-39118
- PHOTOCONDUCTIVE AND LUMINESCENT BEHAVIOR OF UNDOPED CADMIUM SULFIDE SINGLE CRYSTALS AT ROOM TEMPERATURE UNDER LASER EXCITATION A66-39165
- MOLECULAR LASER ACTION BY VIBRATIONAL EXCITATION OF NITRIC OXIDE DURING FLASH PHOTOLYSIS OF NITROSYL CHLORIDE A66-39166
- LASER AMPLIFIER THEORY USING FABRY- PEROT INTERFEROMETER AND LAPLACE TRANSFORM FOR OBTAINING TRANSIENT SOLUTIONS IN ADDITION TO STEADY STATE SOLUTIONS A66-39224
- GAS LASER FREQUENCY AND EMITTED POWER DEPENDENCE ON RESONATOR TUNING A66-39308
- HIGH FREQUENCY-STABILITY EM WAVE SOURCE, APPLYING THERMAL EXCITATION METHODS TO PENCIL QUANTUM GENERATOR IN IR REGION A66-39336
- LINE WIDTH OF WELL-STABILIZED LASER OPERATING FAR ABOVE THRESHOLD DETERMINED BY PHASE RANDOM FLUCTUATION, USING INTERFEROMETER A66-39394
- HIGH FREQUENCY-STABILITY EM WAVE SOURCE, APPLYING THERMAL EXCITATION METHODS TO PENCIL QUANTUM GENERATOR IN IR REGION A66-39706
- SINGLE PULSE OPERATION OF LASERS, NOTING ENERGY STORAGE AND AMPLIFICATION EFFECT FOR FOUR- AND THREE-LEVEL ACTIVE MEDIUM A66-39711
- REPLACEMENT OF POISSON BY POLYA DISTRIBUTION IN CALCULATING LASER INTENSITY THRESHOLD NECESSARY TO INDUCE IONIZATION BREAKDOWN IN GASES A66-39715
- FAR-FIELD LIGHT EMISSION MODE PATTERN OF GA AS DIODE INJECTION LASERS, DIELECTRIC GRADIENT IN INVERSION LAYER AND REFRACTIVE INDEX IN JUNCTION A66-39743
- LASER RADIATION EFFECT ON METALS, NOTING DISINTEGRATION MECHANISM, INDENTATION FORMATION AND VAPOR FORMATION A66-39763
- RUBY LASER PUMPING THRESHOLD ENERGY, DIVERGENCE ANGLE AND OUTPUT POWER AS AFFECTED BY RESONATOR LENGTH A66-39769
- EFFECTIVE BRIGHTENING OF LASER RADIATION PROPAGATING IN STRONGLY ABSORBING MEDIUM A66-39770
- THERMOELASTIC WAVE EQUATIONS IN CONTINUUM MECHANICS MODEL OF LASER-INDUCED FRACTURE IN TRANSPARENT MEDIA IN TERMS OF LASER BEAM ENERGY ABSORPTION A66-40089
- SPECTRAL HOLE BURNING AND CROSS RELAXATION EFFECTS ON STEADY STATE GAIN SATURATION OF LASER AMPLIFIER WITH INHOMOGENEOUSLY BROADENED LINewidth A66-40098
- INTRACAVITY INTERFEROMETER LASER MEASUREMENTS OF POWER GAIN AND OUTPUT IN SINGLE-FREQUENCY AR LASER AND 6328-ANGSTROM NE ISOTOPE SHIFT A66-40110
- REFLECTING MIRRORS IN LASER OSCILLATORS TREATED AS REFLECTING ELEMENTS AND TRANSDUCERS FOR COUPLING POWER FROM OSCILLATOR TO EXTERNAL SPACE A66-40184
- TEMPERATURE MEASUREMENTS OF LASER SPARKS FROM RELATIVE INTENSITY OF X-RAY FLUX TRANSMITTED THROUGH BERYLLIUM FOILS OF DIFFERENT THICKNESS A66-40421
- DYNAMIC LASER WAVELENGTH SELECTION BY INSERTION OF DISPERSIVE TUNABLE ELECTRO-OPTIC Q-SPOILER WITHIN LASER CAVITY A66-40866
- PASCHEN SERIES LASER LINES IN ATOMIC AND MOLECULAR HYDROGEN A66-40892
- SPECTRAL ANALYSIS OF LASER DISCHARGE IN PURE AND IMPURE HE, OBTAINING SPECTRA OF SPARK AT VARIOUS PRESSURES, DETERMINING ELECTRON CONCENTRATION AT VARIOUS STAGES A66-40946
- QUANTITATIVE PHOTOGRAPHIC DETERMINATIONS OF LASER BEAM POWER DENSITY DISTRIBUTIONS AND Q-SWITCHED RUBY OSCILLATOR-AMPLIFIER SYSTEM DIVERGENCE CHARACTERISTICS A66-41032
- NEODYMIUM DOPED GLASS LASER USING SATURABLE LIQUID Q-SWITCH A66-41033
- TRANSIENTS AND STABILITY OF IDEALIZED TWO-LEVEL LASER SYSTEM, OBTAINING RATE EQUATION SOLUTION, NOTING CHARACTERIZATION BY RELAXATION TIMES A66-41034
- PULSED INDUCED EMISSION IN HYDROGEN BEAM LASER FOR CASE OF TWO RELAXATION TIMES, DETERMINING POLARIZATION ONLY BY NUMBER OF ACTIVE PARTICLES IN RESONATOR A66-41091
- DEPENDENCE OF EMISSION INTENSITY OF GAS LASER ON LONGITUDINAL AND TRANSVERSE MAGNETIC FIELDS, USING

- SIMPLIFIED MODEL A66-41092
- MERCURY, CESIUM AND RUBIDIUM VAPORS IONIZATION IN INTENSE RADIATION FLUX BY Q-SWITCHED RUBY LASER A66-41156
- INTERNAL SELF-DAMAGE IN 25 MW RUBY LASER OSCILLATOR ROD A66-41160
- CRYSTAL DEFECTS AND PERFORMANCE IN RUBY LASER, MEASURING COHERENCE FUNCTION OF LIGHT AND OUTPUT ENERGY AND CRYSTAL HOMOGENEITY A66-41291
- MASTER EQUATION SOLVED TO OBTAIN DIAGONAL ELEMENTS OF DENSITY MATRIX FOR LASER LIGHT, TAKING INTO ACCOUNT PUMPING SCHEME CHARACTERIZING THREE-LEVEL LASER A66-41374
- LASER BEAM EFFECT ON HYDRODYNAMIC BEARINGS, DISCUSSING MICROCRACKS AND CRITICAL ENERGY, EXPLAINING BREAKDOWNS A66-41409
- ESTIMATED GREATEST PERMISSIBLE MIRROR MISALIGNMENT, ACTIVE MEDIUM INHOMOGENEITY AND EXTRA-AXIAL BEAM LOSSES FOR ARTIFICIAL REALIZATION OF VERY NARROW RADIATION PATTERN IN REAL LASER A66-41449
- RADIATIVE POWER AMPLIFICATION OF HE- NE LASER WITH NEARLY CONFOCAL RESONATORS A66-41453
- LINEARLY AND CIRCULARLY POLARIZED FIELDS IN LASER AMPLIFIER INTERACTION WITH AXIAL MAGNETIC FIELD, EMPHASIZING COMBINATION TONE PRODUCTION A66-41624
- LASER INDUCED PLASMA DENSITY MEASUREMENT USING MULTIPLE BEAM INTERFEROMETRY A66-41630
- MULTIPURPOSE ULTRAHIGH SPEED CAMERA SYSTEM, NOTING USE AS MONOSECOND KERR CELL, IMAGE CONVERTER AND GIANT LASER PULSE GENERATOR A66-41675
- RESONATOR MISALIGNMENT EFFECT ON OUTPUT OF NEON-HELIUM LASER WITH SPHERICAL MIRRORS A66-41830
- TRANSITIONS OF FIRST TWO BAND SYSTEMS OF IODINE EXCITED IN ARGON SUITABLE FOR LASER ACTION A66-42085
- EXPERIMENTAL STUDY OF EMISSION CONTROL IN RUBY LASER USING DIFFRACTION MODULATOR WITH MODULATED TRAVELING ULTRASONIC WAVE A66-42129
- CONDUCTIVITY MODULATION BY HEAVY-TO-LIGHT HOLE TRANSITIONS IN P-TYPE GERMANIUM NOTING CARRIER LIFETIME AND RINGING OF LASER PULSE A66-42249
- TIME DEPENDENCY OF PHASE DIFFERENCE OF TWO WEAKLY COUPLED NONLINEAR OPTICAL OSCILLATORS, CONSIDERING COUPLING OF TWO TRAVELING WAVES IN LASER A66-42257
- Q-SWITCHING LASER SYSTEM TO OBTAIN SIMULTANEOUS GIANT PULSES FROM FIVE RUBY LASER OSCILLATORS A66-42302
- GIANT PULSE GENERATION RANGE IN TRANSVERSE DIRECTION AFTER Q-SWITCHING IN RUBY LASER, EXAMINING RESONATOR PROPERTIES A66-42516
- MULTIPLE CYCLOTRON RESONANCE ABSORPTION LINES IN DEGENERATE VALENCE BANDS OF GE SEMICONDUCTOR STUDIED WITH FAR IR LASER SUBMILLIMETER SPECTROMETER A66-42545
- LINEARIZED POPULATION RATE EQUATIONS AND QUANTUM NOISE SOURCES USED TO CALCULATE SPECTRA OF INTRINSIC SECOND MOMENT INTENSITY FLUCTUATIONS IN 3- AND 4-LEVEL CW LASER OSCILLATORS A66-42548
- RADIATION INTERACTION BETWEEN LASER OSCILLATORS WITH DIFFERENT ACTIVE MATERIALS AND FREQUENCIES A66-42549
- SELF-TRAPPING OF LASER BEAM DUE TO DIFFRACTION FROM DIELECTRIC WAVEGUIDE ARISING FROM PERMITTIVITY INCREASE OF BIREFRINGENT BEAM A66-42554
- RING LASER ROTATION RATE SENSOR NOTING RELATION TO ELECTROMAGNETIC RADIATION A66-42564
- GAS PUMPING EFFECT ON OUTPUT OF REPETITIVELY PULSED ION LASERS A66-42569
- NARROW SPECTRAL OUTPUTS FROM ACTIVELY Q-SWITCHED LASERS, DERIVING FRACTIONAL ENERGY EXPRESSION FOR INJECTED MODE GROUP A66-42570
- CONFIGURATIONS FOR REALIZATION OF MULTIPLE LASER LIGHT SCATTERING USING MICROWAVE ACOUSTIC WAVES AND TWO PORRO PRISMS A66-42636
- RADIATION OF GIANT PULSES OF SUPERLUMINESCENCE BY HIGHLY EXCITED ACTIVE MEDIUM OF NO GLASS WITH RAPID CUT-IN OF AMPLIFICATION A66-42755
- GLASS LASERS, COMPARING GLASS WITH CRYSTALS AS HOSTS FOR LASER IONS, CONSIDERING NEODYMIUM LASER PROPERTIES A66-42800
- LASERS APPLIED TO LOGIC, MEMORY, INPUT-OUTPUT AND DATA TRANSMISSION-LINKAGES PARTS OF COMPUTERS A66-42804
- NONLINEAR OPTICS EMPHASIZING PARAMETRIC OSCILLATION, SELF-FOCUSING AND TRAPPING OF LASER BEAMS AND STIMULATED RAMAN, RAYLEIGH AND BRILLOUIN SCATTERING, USING MAXWELL EQUATIONS AND ELECTRIC DIPOLE APPROXIMATION A66-42810
- LASER BEAM DEFLECTION AND SCANNING TECHNIQUES A66-42817
- CURRENT TRANSDUCER FOR MEASURING CURRENT PULSES IN KILOAMPERE RANGE AND SUITABLE FOR LASER RESEARCH APPLICATIONS A66-42820
- EFFECT OF LONGITUDINAL MAGNETIC FIELD ON OUTPUT POWER OF GAS LASER OPERATING IN IR SPECTRUM, NOTING GAS-MIXTURE PRESSURE IN DISCHARGE TUBE A66-42977
- OPTICAL TRANSMISSION OF PLASMA COLUMN GENERATED BY IONIZED GAS EXPLOSION DETERMINED, USING LASER BEAM A66-42998
- PERTURBATION OF RUBY LASER BY VIBRATING ONE OF MIRRORS CONSTITUTING RESONANT CAVITY A66-42999
- SPECTROSCOPIC, CHEMICAL AND LASER PROPERTIES OF PIPERIDINIUM SALT OF EUROPIUM TETRAKIS A66-43034
- LASER SYSTEM FOR METEOROLOGICAL DATA USING OSCILLOSCOPE TO DISPLAY RETURN SIGNAL, TRANSLATED AS CONCENTRATIONS OF MATTER OR AEROSOLS A66-43044
- SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION A66-43085
- GALLIUM ARSENIDE INJECTION LASER OPTIMIZATION FOR MAXIMUM POWER OUTPUT ECOM-2613 N66-24779
- AEROSPACE TECHNOLOGY RESEARCH IN U.S.S.R. - LASER ACTION BY SUPERCOOLED PLASMA, LITHIUM CRYSTAL GROWTH, METALLOSILOXANE POLYMER SYNTHESIS AND SPACE TECHNOLOGY CINEMATOGRAPHY N66-32699
- LASER ACTION BY RAPID ELECTRON COOLING OF IONIZED DENSE HYDROGEN PLASMA N66-32700
- NEW CLASS LIGHT FILAMENT IDENTIFIED IN RAMAN RADIATION OF INTENSE RUBY LASER BEAM NASA-TM-X-57831 N66-33863
- ATMOSPHERIC HEATING BY LASER PULSES IN

- TRANSMISSION WINDOWS  
TRW-4535-6003-RO-000 N66-34232
- MAXIMUM OUTPUT POWER FROM RUBY LASER AS FUNCTION  
OF PUMPING FOR SEVERAL INTERFEROMETER BASE  
VALUES  
TG-230-T479 N66-37072
- OPTIMUM OPERATING CONDITIONS OF RUBY LASER QUANTUM  
GENERATOR WITH PASSIVE SHUTTER N66-37711
- CONCENTRATION OF CHROMIUM IONS IN RUBY LASER  
CRYSTAL LATTICE DETERMINED FROM RADIATION OUTPUT  
CHARACTERISTICS N66-37712
- HIGH CURRENT DISCHARGE EFFECT ON MAGNETICALLY  
CONFINED ARGON LASER A67-10012
- OPTICAL SURFACE ROUGHNESS MEASUREMENT USING  
COHERENT RADIATION PRODUCED BY HELIUM-NEON LASER  
SIGMA-POLARIZED AT 6328 ANGSTROMS A67-10020
- SEMICONDUCTOR LASER ARRAY STRUCTURE WITH COMMON  
N-TYPE SUBSTRATE AND INDIVIDUAL CONTACTS TO  
P-LAYER FOR HIGHER OPTICAL POWER OUTPUT A67-10023
- LI F SINGLE CRYSTAL DESTRUCTION AS FUNCTION OF  
LASER BEAM ENERGY, EXAMINING DISLOCATION PATTERN  
ARISING FROM CRACK PROPAGATION A67-10071
- POLYMETHYLMETHACRYLATE AND POLYSTYRENE EXPOSURE  
TO RUBY AND NEODYMIUM-GLASS LASER RADIATION,  
NOTING APPEARANCE OF EPR A67-10075
- CURRENT INJECTION EFFECT ON TIME DELAY OF GA AS  
LASER RADIATION A67-10083
- LASER PRODUCING TWO OR THREE LIGHT PULSES IN  
SEQUENCE WITH INTERVAL BETWEEN PULSES MECHANICALLY  
CONTROLLED BY OPTICAL WEDGE INSERTED INTO  
RESONATOR A67-10161
- ADJUSTMENT PROCEDURE FOR LASER WITH POLYGONAL  
RESONATOR, NOTING SPATIAL MIRROR ADJUSTMENT IN  
ADDITION TO ANGULAR ADJUSTMENT A67-10162
- NICKEL-COPPER CONE CALORIMETER DESIGN AND  
FABRICATION FOR LASER ENERGY MEASUREMENTS A67-10193
- INTERFERENCES BETWEEN WAVES DIFFRACTED BY CIRCULAR  
SCREENS OR THIN WIRES AND COHERENT BACKGROUND  
PROVIDED BY LASER, PRODUCING RINGS OR RECTILINEAR  
FRINGES A67-10231
- C W LASER USING 3-INCH RUBY CRYSTALS WITH 15  
PERCENT MIRROR TRANSMISSION, PUMPING POWER OF  
DOUBLE THRESHOLD VALUE AND 1.6 WATT POWER OUTPUT  
A67-10244
- LASER ACTION IN OPTICALLY PUMPED CN, DISCUSSING  
VIBRATIONAL-ROTATIONAL TRANSITIONS A67-10370
- THREE NEW VISIBLE CW LASER LINES IN DISCHARGE IN  
SINGLY-IONIZED CL A67-10373
- DIFFUSELY TRANSMITTING INTEGRATING SPHERE WITH  
SOLID STATE PHOTODIODE USED IN LASER OUTPUT  
MEASUREMENT A67-10445
- NE- HE LASER OUTPUT DEPENDENCE ON PRESSURE AND  
NONEXCITED ATOM CONCENTRATION A67-10512
- LASER LINES OF PULSED DISCHARGE IN IODINE VAPOR  
A67-10549
- INTERFERENTIAL METHOD OF TESTING HIGH RESOLUTION  
PHOTOGRAPHIC EMULSIONS, USING LASER AS LIGHT  
SOURCE A67-10832
- RADIATION OF GIANT PULSES OF SUPERLUMINESCENCE BY  
HIGHLY EXCITED ACTIVE MEDIUM OF ND GLASS WITH  
RAPID CUT-IN OF AMPLIFICATION A67-10837
- THERMALIZATION RATE OF HIGHLY IONIZED PLASMA WITH  
INITIALLY HOT IONS AND COLD ELECTRONS, USING LASER
- SCATTERING TO OBSERVE TIME VARIATION OF ELECTRON  
TEMPERATURE A67-10912
- NARROW BEAM DIVERGENT Q-SWITCHED LASER PULSE  
GENERATION, NOTING OUTPUT CHARACTERISTICS AND  
APPLICATIONS A67-11024
- LASER LINES OF PULSED DISCHARGE IN IODINE  
VAPOR A67-11057
- SPATIAL COHERENCE OF LASER LIGHT BEAM AFTER  
EXTREME WAVEFRONT DISTORTIONS ON DIFFUSION  
EXPLAINED ON BASIS OF FRAUNHOFER AND FRESNEL  
DIFFRACTION A67-11062
- FOURIER TRANSFORM HOLOGRAPHY FOR DIFFUSION OF  
COHERENT LASER LIGHT BEAM, EXAMINING DISTORTION  
TERM IN RECONSTRUCTED IMAGE A67-11063
- LASER EXCITED ELECTRONIC RAMAN SPECTRUM OF  
TRIVALENT EU ION DOPED Y GA GARNET A67-11084
- TEMPERATURE DEPENDENCE OF THRESHOLD FOR STIMULATED  
EMISSION OF ND TRIVALENT ION IN SEVERAL HOST  
LATTICES ESTIMATED FROM INTENSITY VARIATION OF  
LASER ACTIVE FLUORESCENCE COMPONENT A67-11085
- DYNALENS OPTICAL ELEMENT CHARACTERIZED BY  
VARIABLE-GEOMETRY FLUID PRISM THAT DEFLECTS BEAM  
OF LIGHT OR ELECTROMAGNETIC ENERGY A67-11132
- AUDIO FREQUENCY PROPORTIONAL TO ROTATION RATE OF  
REENTRANT LASER CAVITY SYSTEM DERIVED FROM SINGLE  
OUTPUT BEAM A67-11322
- LASER CHARACTERISTICS OF NARROW BAND TYPE I SOLAR  
RADIO BURST AND MAGNETIC DIPOLE TRANSITIONS IN  
SPLIT ZEEMAN SUBLEVELS OF HYDROGEN ATOMS OF  
SOLAR CORONA IN GROUND LEVEL A67-11652
- THREE-MIRROR LASER INTERFEROMETER MEASURING  
ELECTRON DENSITIES IN REPETITIVELY PULSED PLASMAS  
A67-11875
- SECOND HARMONIC GENERATIONS AND MIXINGS OF RAMAN  
LINES PRODUCED IN CYCLOHEXANE, ACETONE, BENZENE  
AND CARBON DISULFIDE, PHOTOGRAPHING FIRST ORDER  
STOKES RADIATION A67-12052
- VELOCITY ABERRATION AND ATMOSPHERIC REFRACTION  
PERTAINING TO LASER SATELLITE COMMUNICATION  
EXPERIMENTS, OBTAINING EQUATIONS FOR ESTIMATION OF  
EFFECTS A67-12054
- SELF-FOCUSING OF LASER BEAM IN PLASMA, SOLVING  
WAVE EQUATION FOR SLAB AND CYLINDRICAL BEAM  
CONFIGURATIONS A67-12089
- SELF-FOCUSING OF RUBY LASER BEAM IN NA CL  
CRYSTALS A67-12481
- SELF-LOCKING MODES IN ARGON ION LASER, OBSERVING  
SUBNANOSECOND PULSATION OF LASER OUTPUT WITH  
WIDEBAND PHOTOMULTIPLIER A67-12503
- TIME EVOLUTION OF LASER INDUCED FRACTURES IN  
GLASS, NOTING CRACK PROPAGATION ACCOMPANIED BY  
SPARKING A67-12508
- HOLOGRAM COPYING METHOD USING GAS LASER AS LIGHT  
SOURCE A67-12513
- PUMPING OF ORGANIC DYES IN ORGANIC SOLVENTS, USING  
PULSED RUBY LASER A67-12515
- H-2 STOKES RAMAN OSCILLATOR OPERATING AT 9755  
ANGSTROMS, FINDING PERFORMANCE AS EXPECTED OF  
LASER OSCILLATORS WITH BEAM INSTABILITY NOT  
DEVELOPED A67-12516
- ABSOLUTE DIRECT EXCITATION CROSS SECTION FROM  
NEUTRAL GROUND STATE FOR UPPER LEVELS OF  
TRANSITION IN ARGON LASER A67-12520
- TWYMAN- GREEN ARRANGEMENT OF INTERFEROMETER WITH  
NARROW LASER BEAM AND TWIN PHOTOMULTIPLIERS,

EXAMINING STRONG SHOCKS IN ARGON IN 15.2 CM SHOCK TUBE A67-12688

RUBY LASER PUMPING THRESHOLD ENERGY, DIVERGENCE ANGLE AND OUTPUT POWER AS AFFECTED BY RESONATOR LENGTH A67-12855

STATISTICAL EFFECTS DURING GENERATION OF SECOND HARMONIC IN OPTICALLY TRANSPARENT CRYSTALS, NOTING COEFFICIENT OF CORRELATION BETWEEN HARMONIC AND FUNDAMENTAL RADIATION POWER OF SOLID STATE LASER A67-12928

GIANT COHERENT LIGHT PULSE GENERATION BY Q-FACTOR MODULATED LASER A67-12941

RUBY LASER FREQUENCY CONVERSION TECHNIQUE BY LASER BEAM SCATTERING AND MIXING OF COMBINED FREQUENCIES A67-13094

TUNABLE DISPERSION RESONATOR AND BROADENING OF LASER EMISSION SPECTRAL RANGE TO OBTAIN OPERATING FREQUENCY OTHER THAN FUNDAMENTAL A67-13131

UNCOUPLED INTENSITY PEAKS IN LASER EMISSION A67-13132

EMISSION LOSSES IN SOLID STATE LASER RESONATOR CALCULATED FOR ND GLASS LASER A67-13133

STEADY STATE LASER RADIATION DURING RELAXATION, DISCUSSING TIME-DEPENDENT SPECTRAL COMPOSITION, OSCILLATION MODES AND POLARIZATION CHARACTERISTICS A67-13134

S HF MODULATION TECHNIQUES FOR LASER RADIATION, COVERING FARADAY, KERR AND POKEL EFFECTS, CIRCULAR DICHROISM, ETC A67-13138

FLUORESCENT EMISSION OF NEODYMIUM LASER TRIGGERED BY POKELS EFFECT AS FUNCTION OF POPULATION INVERSION A67-13201

PERFORMANCE OF TWO-PHOTON LASER OPERATING IN CONTINUOUS WAVE MODE, DERIVING FORMULA FOR PULSE FREQUENCY A67-13292

CALORIMETER USING ENAMELED COPPER WIRE WITH VARIABLE RESISTANCE FOR MEASURING LASER ENERGY AND OUTPUT POWER A67-13536

LASER BEAM-INDUCED RECRYSTALLIZATION OF AMORPHOUS GE SEMICONDUCTOR THIN FILMS PREPARED BY THERMAL DEPOSITION ON GLASS A67-13839

COMPUTER CALCULATIONS PERMITTING INVESTIGATION OF TIME CHARACTERISTICS OF RADIATION IN INVESTIGATION OF LASER WITH PASSIVE CELL A67-13962

POLYA DISTRIBUTION DESCRIBING PHOTON CORRELATIONS IN IONIZING LASER BEAMS ENABLES DIFFERENTIATION BETWEEN VARIOUS MULTIPHOTON IONIZATION PROCESSES A67-13982

STATISTICAL DISTRIBUTION OF AM LASER SIGNAL ENVELOPE UPON PASSAGE THROUGH TURBULENT ATMOSPHERE A67-13988

RING LASER ROTATION SENSING SYSTEM, EVALUATING ACCURACY LIMIT FOR MINIMIZED INACCURACY OF KNOWN SOURCES OF ERROR A67-13992

ESTIMATED GREATEST PERMISSIBLE MIRROR MISALIGNMENT, ACTIVE MEDIUM INHOMOGENEITY AND EXTRA-AXIAL BEAM LOSSES FOR ARTIFICIAL REALIZATION OF VERY NARROW RADIATION PATTERN IN REAL LASER A67-14185

CHARACTERISTICS OF PULSED LASER ACTION IN HE- NE AND HE- AR MIXTURES AT PRESSURES ABOVE 200 MM HG A67-14189

RADIATIVE POWER AMPLIFICATION OF HE- NE LASER WITH NEARLY CONFOCAL RESONATORS A67-14190

TEMPORAL-SPATIAL VARIATION OF CROSS SECTIONAL FLUX DISTRIBUTION OF STIMULATED EMISSION FROM ND GLASS

PULSED LASER A67-14280

INTERFERENCES BETWEEN COHERENT LIGHT BACKGROUND AND LIGHT DIFFRACTED BY SMALL APERTURE IN CASE OF STRONGLY ASTIGMATIC BEAM A67-14416

OPTICAL SYSTEM CONSISTING OF POLARIZED LASER BEAMS FOR MONITORING MISSILE ATTITUDE DURING EARLY LAUNCH PHASE A67-14505

TRIVALENT NEODYMIUM DOPED GLASS LASER WITH INTERNAL IMPERFECTIONS DUE TO OPTICAL PUMPING EXAMINED VIA OPTICAL METALLOGRAPHY, TRANSMISSION ELECTRON MICROSCOPY AND ELECTRON DIFFRACTION TECHNIQUES A67-14927

PHASE LOCKED LASER LOOP FOR AMPLITUDE AND PHASE MEASURING DEVICE FOR COHERENT OPTICAL WAVE FRONTS A67-15076

KINETIC ENERGIES OF IONS PRODUCED BY GIANT LASER PULSES, NOTING DEPENDENCE OF MEAN SQUARE ION VELOCITY ON PULSE PEAK INTENSITY A67-15099

NEODYMIUM-GLASS LASER USING SPONTANEOUS AMPLIFIED EMISSION IN NONRESONANT SYSTEM TO OBTAIN HIGH BRIGHTNESS OUTPUT PULSE A67-15100

ELECTRON RECOMBINATION IN LASER PRODUCED HYDROGEN DISCHARGE, NOTING TEMPERATURE DECAY DUE TO RADIATION, EXPANSION COOLING AND ELECTRON LOSS A67-15109

SINGLE MODE OUTPUT POWER MODULATION ANALYSIS OF SATURATION AND GAIN OF GAS LASERS AND EFFECTS OF EXCITATION DENSITY MODULATION AND RESONATOR Q MODULATION A67-15111

PULSED LASERS AS MACHINE TOOLS FOR MATERIAL REMOVAL, NOTING TESTS ON TITANIUM, ALUMINUM OXIDE, STEEL, ETC A67-15308

LASER SYSTEM FOR DIAMOND PIERCING IN WIRE-DRAWING DIES AND CLOSED CIRCUIT TV VIEWING SYSTEM FOR MONITORING OPERATION A67-15309

MODULAR LIQUID-COOLED CYLINDRICAL RUBY LASER MICROWELDER DESIGN AND CONSTRUCTION A67-15310

DATA RECORD AND READOUT SYSTEMS DEPENDENCE ON PRECISE SPOT AND LINE SCAN METHODS, USING DIFFRACTION LIMITED SPOTS OF LASER GENERATED LIGHT A67-15321

DIFFRACTION LIMITED PERFORMANCE ACHIEVED FOR FLYING SPOT RECORDING AND READOUT, USING CONCENTRIC OPTICAL SYSTEM, APPLIED TO LASER SCANNER A67-15322

MULTIGIGAWATT OSCILLATOR-AMPLIFIER RUBY LASER SYSTEM FOR HIGH TEMPERATURE PLASMA RESEARCH ASME PAPER 66-WA/ENER-2 A67-15371

LASER MICROPROBE USED TO STUDY SMALL INCLUSIONS IN METALS A67-15461

POPULATION INVERSION VARIATION DURING LASER EMISSION AS SHOWN BY MEASUREMENTS OF FLUORESCENCE INTENSITY A67-15497

FRACTION OF LUMINOUS ENERGY CAPTURED BY OPTICAL PUMPING LASERS IN GIVEN GEOMETRICAL CONFIGURATION, OBTAINING FUNCTIONING THRESHOLD DEPENDING ONLY ON CRYSTAL A67-15498

LASER GUIDANCE SYSTEM FOR RENDEZVOUS AND DOCKING PROVIDING DATA ACQUISITION FOR GUIDANCE COMPUTER A67-15663

PERFORMANCE OF GA AS SEMICONDUCTOR LASER WITH RESONATOR, NOTING DEPENDENCE OF FORBIDDEN ZONE WIDTH AND ABSORPTION COEFFICIENT ON FREE CARRIER CONCENTRATION AND INCIDENT PHOTON ENERGY A67-15759

INTERCHANNEL GENERATION TRANSFER AND MULTICHANNEL GENERATION IN LASER WITH FOUR UNSPLIT LEVELS,



- NOTING RADIATION DENSITY, TEMPERATURE EFFECT AND VARIATIONS IN COEFFICIENTS OF LOSSES  
A67-15760
- STEADY STATE INTENSITY FLUCTUATIONS AND STATISTICS OF LASER OPERATING ABOVE THRESHOLD  
A67-15776
- NATURE OF EXCITED STATE RESULTING FROM TWO-QUANTUM ABSORPTION ASSOCIATED WITH FLUORESCENCE IN ANTHRACENE PRODUCED BY RUBY LASER  
A67-16130
- VISUAL ACUITY DECUREMENT FROM LASER LESION IN FOVEA OF STUMP TAIL MACAQUE MONKEYS  
A67-16287
- FISSION OR RADIOISOTOPIC NUCLEAR RADIATION APPLIED TO LASER PUMPING, DISCUSSING FORMS, SOURCES, POWER, SOLID STATE AND MOLECULAR GAS LASERS, ENERGY TRANSFER, OPTICAL FLUORESCENCE AND CUT-OFF PHENOMENON  
A67-16547
- FREQUENCY FLUCTUATIONS OF LASER FIELD DETERMINED BY MEASURING CROSS CORRELATION FUNCTION AT TWO POINTS  
A67-16625
- SEMICLASSICAL AND RATE EQUATIONS COMPARED FOR DETERMINATION OF OUTPUT POWER OF STEADY STATE RUBY LASER  
A67-16628
- TUBE DIAMETER INFLUENCE ON OUTPUT POWER AND EFFICIENCY OF GAS LASER  
A67-16629
- TRANSIENT AND STEADY STATE IR EMISSION FROM LOW-LYING VIBRATIONAL LEVELS OF CARBON DIOXIDE IN LASER SYSTEMS, USING DC DISCHARGE  
A67-16630
- EXCITATION AND RELAXATION MECHANISMS FOR CLOSED MOLECULAR GAS LASER  
A67-16631
- MOLECULAR GAS LASER Q-SWITCHING TECHNIQUES, DETERMINING ROTATIONAL COLLISION SECTIONS FOR CARBON DIOXIDE AND CROSS SECTIONS FOR VIBRATIONAL RELAXATION  
A67-16632
- HIGH RESOLUTION SPECTROSCOPY USING ZEEMAN-TUNED IR LASER OSCILLATING AT TRANSITIONS BETWEEN 3 AND 9 MICRONS  
A67-16633
- GAS LASER PUMPED MICROWAVE EMISSION FOR PRODUCING CONTROLLED EXCITED STATE POPULATION FOR RF SPECTROSCOPY OF NEON  
A67-16638
- SECOND HARMONIC GENERATION OF LIGHT BY FOCUSED LASER BEAMS IN NONLINEAR CRYSTALS AT EXIT SURFACE  
A67-16640
- DOPPLER AND IMPACT BROADENING OF SPECTRAL LINES AND PRESSURE EFFECTS ON POWER OUTPUT OF GAS LASER  
A67-16643
- INTRACAVITY TIME-VARYING PERTURBATION OF LOSSES IN GAS LASER USING DIAMAGNETIC FARADAY EFFECT IN GLASSES ANALYZED IN CONNECTION WITH OUTPUT INTENSITY  
A67-16646
- PROPERTIES OF SELF-TRAPPED LIGHT FILAMENTS NOTING STIMULATED RAMAN EMISSION AND CREATION, CONTAINMENT AND TERMINATION MECHANISMS  
A67-16648
- SELF-FOCUSING DUE TO INTENSITY DEPENDENT ANOMALOUS DISPERSION EFFECT ON ELECTROMAGNETIC RADIATION, EMPHASIZING LASER RADIATION IN SATURATED AMPLIFYING MEDIUM  
A67-16649
- POSITIVE ION EMISSION FROM TUNGSTEN SURFACES LASER IRRADIATED STUDIED, USING TIME-OF-FLIGHT SPECTROMETER  
A67-16651
- GAS DYNAMIC EQUATIONS FOR DETERMINATION OF HEATING, VAPORIZATION AND EXPANSION OF SUBSTANCE DUE TO Q-SWITCHED LASER RADIATED COLLIMATES ONTO SURFACE OF SOLIDS  
A67-16652
- OUTPUT SPECTRA OF Nd DOPED YAG AND RUBY LASERS, DETERMINING MECHANISMS RESPONSIBLE FOR OBSERVED OVERALL LINEWIDTHS  
A67-16660
- DIVALENCE SAMARIUM ION DOPED CALCIUM FLUORIDE LASER ACTION AT LOW TEMPERATURES OBTAINED WITH GIANT PULSE RUBY LASER EXCITATION  
A67-16661
- EQUATION FOR DYNAMICAL BEHAVIOR OF LASER, SOLVING CASE OF DEEP MODULATION OF OUTPUT, NOTING PULSATION PROBLEMS  
A67-16662
- ELECTRON DENSITIES IN HELIUM PLASMA MEASURED BY LASER AMPLIFIER WITH MAXIMUM GAIN AND MINIMUM BANDWIDTH AT POINT NEAREST THRESHOLD  
A67-16663
- LASER EMISSION AT 1.06 MICRONS FROM YTTERBIUM-NEODYMIUM GLASS, NOTING LINEARITY OF ENERGY TRANSFER WITH YB CONCENTRATION  
A67-16664
- C W ARGON ION LASER SCATTERING IN ARGON PLASMA, NOTING RESONANCE AND CORRELATION BETWEEN DATA AND PLASMA PROPERTIES  
A67-16665
- PASSIVE CORE FIBER LASER DOES NOT REMOVE COMPLETELY NEED FOR OPTICAL QUALITY IN CLADDING MATERIAL  
A67-16666
- OSCILLATION IN CD S CRYSTAL BY RUBY LASER INDUCED TWO-PHOTON EXCITATION, NOTING PROPORTIONALITY OF ABSORPTION COEFFICIENT TO LIGHT BEAM INTENSITY  
A67-16667
- LINE WIDTH OF CW GA-AS LASERS MEASURED USING HOMODYNE DETECTION AND AUTOCORRELATION  
A67-16670
- TERMINAL LEVEL LIFETIME AND FLUORESCENCE LINE OF NEODYMIUM DOPED GLASS INFLUENCE ON DYNAMICS AND EFFICIENCY OF Q-SPOILED LASER  
A67-16675
- Q-SWITCHED LASER OPERATION OBSERVED USING LIQUID SELENIUM MIRROR AS REFLECTOR IN RUBY LASER MEASURING REFLECTIVITY CHANGES  
A67-16679
- TUNABLE RAMAN LASER OBTAINED BY ELECTRON MOBILITY SUBJECTED TO MAGNETIC FIELD, NOTING THRESHOLD PUMP POWER  
A67-16684
- SINGLE MODE 6328 ANGSTROM UNITS HE-NE LASER HAVING SINGLE FREQUENCY POWER OUTPUT OF 50 MWATT STABILIZED BY FEEDBACK SYSTEM WHOSE OUTPUT IS NEITHER AMPLITUDE NOR FREQUENCY MODULATED  
A67-16685
- SINGLE MODE OUTPUT POWER MODULATION STUDY OF SATURATION AND GAIN OF GAS LASER  
A67-16686
- SPECTROCHEMICAL ANALYSIS OF SOLID SPECIMEN FROM VAPOR FORMED BY LASER BEAM AND EXCITED BY SPARK DISCHARGE  
A67-16786
- OBJECT-IMAGE RELATIONSHIPS IN SCATTERED LASER LIGHT  
A67-16792
- WAVELENGTH DEPENDENCE OF SPECTRUM OF LASER BEAMS TRAVERSING ATMOSPHERE  
A67-16793
- DAMAGE IN GLASS INDUCED BY LINEAR ABSORPTION OF LASER RADIATION NON-Q-SPOILED  
A67-16794
- ONSET OF OSCILLATION IN HE-NE LASER ANALYZED USING LAMB THEORY, OBTAINING TIME CONSTANT VALUE FOR POPULATION OF LOWER LASER LEVEL  
A67-16821
- THRESHOLD OF PARAMETRIC OSCILLATOR SYSTEM WITH IDLER MODES IN SAME FREQUENCY SPACING AS LASER PUMP SOURCE  
A67-16823
- AMPLITUDE OF LF OSCILLATIONS IN HE-NE LASER  
A67-16948
- RUBY CRYSTALS GROWN BY CZOCHRALSKI TECHNIQUE USING INDUCTION HEATED IRIIDIUM CRUCIBLE, NOTING LASER OSCILLATIONS IN PULLED CRYSTALS  
A67-16975
- GASEOUS LASER OUTPUT EXPRESSED IN SINGLE OR TWO-

LINE OSCILLATIONS AS FUNCTION OF PUMPING RATES AND  
TRANSITION PROBABILITIES, CONSIDERING CONCEPT OF  
EQUIVALENT NETWORK A67-16979

TRANSIENT BEHAVIOR OF HE- NE LASERS UNDER PULSED  
HF EXCITATION, DISCUSSING RATE EQUATIONS  
REPRESENTING ATOMIC POPULATION DENSITY AND PHOTON  
DENSITY A67-16980

LASER RADIATION EFFECT ON HEATING PROCESS AND GAS  
DYNAMIC MOTION OF FINITE TRANSPARENT GAS AND  
MOTIONLESS COLD GAS AT VACUUM INTERFACE A67-17008

LASER BEAM EFFECT ON BENZENE AND OTHER ORGANIC  
COMPOUNDS, NOTING FORMATION OF DARK READILY  
COAGULATING DEPOSIT A67-17028

SUBMILLIMETER WAVELENGTH ELECTRONIC DEVICES,  
EXAMINING DEVELOPMENT OF LASERS AND REFLECTED WAVE  
TUBES WITH OVERLAPPING EFFECTIVE WAVE RANGE A67-17168

LASER MIRROR DESIGN IN LENS FORM FOR DECOUPLING  
DIFFRACTION LIMITED PARALLEL BEAM, BASED ON  
THEOREMS CONCERNING GAUSSIAN BEAM IMAGING AND  
BEHAVIOR A67-17327

FARADAY ROTATION MEASUREMENT OF TRAPPED MAGNETIC  
FIELDS IN THETA PINCH PLASMA, USING GAS LASER BEAM  
A67-17447

OPERATION OF SYNCHRONIZED NEODYMIUM LASER TIME  
VARIABLE REFLECTION / TVR/ OSCILLATOR, USING  
SINGLE POKELS CELL TO OBTAIN Q-SWITCHING AND  
CAVITY DUMPING A67-17525

DENSITY AND TEMPERATURE OF UPPER ATMOSPHERE,  
SATELLITE TRACKING, GEODETIC APPLICATIONS AND LONG  
DISTANCE MEASUREMENTS, USING LASER OUTPUT A67-17591

TIME STRUCTURE AND AMPLITUDE SELF-MODULATION OF  
EMISSION FROM GA AS INJECTION LASER OBSERVED,  
USING ELECTRON-OPTICAL CONVERTER A67-17756

LUMINESCENCE SPECTRUM OF CU CL AT LOW  
TEMPERATURES EXCITED BY DOUBLE PHOTON ABSORPTION  
FROM HIGH INTENSITY LASER BEAM A67-17822

GIANT PULSE FORMATION THEORY, MEASURING SHAPE AND  
DURATION OF NEODYMIUM GLASS LASER PULSES FOR  
VARIOUS VALUES OF INVERSE POPULATION A67-17876

LASER DISPLAYS APPLICATION, PERFORMANCE AND STATUS  
OF EXISTING DEVICES A67-17887

ELECTRO-OPTIC INTRA-CAVITY COLOR SWITCHING IN  
KRYPTON ION FABRY-PEROT LASER A67-17888

HE- NE LASER FREQUENCY STABILIZATION USING FOUR  
AUTOMATIC FREQUENCY CONTROL / AFC/ SYSTEMS A67-17965

EXTENSION OF PAPER ON SATURABLE ABSORBER GIANT  
PULSE LASERS TO INCLUDE EFFECTS OF FINITE  
ABSORBER LIFETIME ON PULSE PARAMETERS, NOTING  
PUMP ROLE A67-18148

PLASMA FORMED BY LASER PULSE ON TUNGSTEN TARGET,  
MEASURING RADIUS, TEMPERATURE AND RADIATIVE  
PROPERTIES, DEVELOPING MODEL A67-18149

ELECTRON BEAM SPATIAL SCANNING OF COHERENT  
EMISSION OF GA AS JUNCTION LASER AT LOW  
TEMPERATURES, MAKING CURRENT DISTRIBUTION  
NONUNIFORM A67-18150

GAS LASER BEHAVIOR IN MAGNETIC FIELD, ANALYZING  
DATA ON MAGNETIC EFFECT, ZEEMAN EFFECT AND  
MICROWAVE PUMPING A67-18168

TREATMENT OF STEEL WITH LASER BEAM, OBTAINING  
PRECISION HOLES WITHOUT AFFECTING MICROHARDNESS OF  
METAL A67-18234

LASER VELOCIMETER MEASUREMENT OF POINT VELOCITIES  
IN TURBULENT LIQUID FLOW IN PIPE, USING  
STATISTICAL ANALYSIS TO VERIFY RESULTS  
AIAA PAPER 67-179 A67-18511

U V RADIATION GENERATION FROM OUTPUT OF ND GLASS  
LASER BY FREQUENCY DOUBLING IN AMMONIUM DIHYDROGEN  
PHOSPHATE CRYSTALS A67-18712

RESONATOR Q-MODULATION TECHNIQUE OBSERVATION OF  
CENTRAL DIP TUNING IN MODULATED POWER OUTPUT OF  
GAS LASER WITH MOVING MIRROR A67-18758

HIGH POWER LASER BEAM POLARIZATION DIRECTION  
EFFECTS ON ELECTRON EMISSION FROM AG SURFACE  
A67-18759

LASER EXTENSOMETER MEASURING SMALL DIMENSIONAL  
CHANGES OF SPECIMEN IN TENSILE TESTING FURNACE AT  
HIGH TEMPERATURES A67-18778

PRESSURE DEPENDENCE OF OUTPUT POWER OF HE- NE  
LASER ON AMPLITUDE OF PERIODIC HIGH VOLTAGE  
EXCITATION PULSES A67-18784

CHARGED PARTICLE MOTION IN MAGNETIC FIELD UNDER  
ACTION OF LASER EMISSION A67-18787

MULTIPHOTON IONIZATION OF KRYPTON ATOM BY RUBY  
LASER RADIATION A67-18796

DYNAMICS OF NARROWING EFFECT OF SURFACE AND  
SPATIAL DISPERSING AGENTS ON RADIATION LINE OF  
RUBY LASER WITH NONRESONANCE FEEDBACK A67-18797

CLEAVAGE AND SEPARATION OF DYE-DOPED ICE AND  
PARAFFIN INSTANTANEOUSLY HEATED BY LASER PULSE,  
MEASURING MECHANICAL PULSE AT ENERGY  
CONCENTRATIONS BELOW VAPORIZATION HEAT A67-18807

MICRO- AND MACROCRACK FORMATION IN ORGANIC GLASS  
BY FOCUSING OF LASER BEAM A67-18808

R CA PAPERS ON LASER RESEARCH AND ENGINEERING  
A67-19079

LASER SPECTROSCOPY, DISCUSSING ADVANTAGES,  
PRECISION ATTAINABLE, LINE SHAPE AND POSITION  
MEASUREMENTS A67-19087

LASER DIGITAL DEVICES, DISCUSSING USE AS SWITCHING  
CIRCUIT IN DIGITAL COMPUTER A67-19088

SAFETY PROGRAM FOR LASER HAZARDS, DISCUSSING EYE  
AND BODY PROTECTION A67-19089

MICROSCOPIC HOLE DRILLING INTO METALS BY LASER  
BEAMS, NOTING ENERGY AND POWER CORRELATION WITH  
HOLE MAGNITUDE A67-19090

CHANGES IN GIANT MOLECULE STRUCTURE OF  
POLYPROPYLENE FILMS UNDER ACTION OF LASER PULSES  
ANALYZED BY OPTICAL MICROSCOPY A67-19169

TRANSLUCENT AND OPAQUE PHOTOCATHODES ANALYSIS  
A67-19408

HIGH ALTITUDE ATMOSPHERIC SCATTERING OF INTENSE  
LIGHT FROM RUBY LASER BEAM INTERPRETED PRINCIPALLY  
IN TERMS OF RAYLEIGH SCATTERING FROM ATMOSPHERIC  
MOLECULES A67-19419

KERR CELL PROPERTIES NOTING FOUR-ELECTRODE CELL  
GIVING FREQUENCY SHIFT OF 60 MC FOR LASER BEAM  
A67-19552

SPECTRAL PROPERTIES OF ND DOPED YTTRIUM VANADATE  
GROWN FROM MELT, NOTING REDUCED STARK SPLITTING  
LEADING TO LASER ACTION A67-19559

RELATIVE INTENSITIES AND CASCADE TRANSITION RATIO  
IN CW AR II LASER NEAR 4103.9 ANGSTROMS  
A67-19560

PARTICLE NUMBER FLUCTUATION IN SINGLE CELL OF  
KASTLER PHOTON SET, DISCUSSING STATISTICAL  
PROPERTIES OF LASER EMISSION IN MULTIMODE

- EXCITATION REGIME A67-19599
- AXIAL MAGNETIC FIELD EFFECT ON NE- HE LASER POWER OUTPUT OPERATING IN REGIME OF SIMULTANEOUS GENERATION OF 3.39 AND 0.6328 MICRON LINES A67-19601
- ERROR DUE TO MULTIPLE PROPAGATION IN DISTANCE MEASUREMENT BY COMPARISON OF MODULATION PHASES ON TRANSMITTED AND REFLECTED LASER BEAM A67-19606
- GALLIUM ARSENIDE LASER OUTPUT INCREASE DUE TO ALUMINUM EVAPORATED COATING ON SILICON DIOXIDE USED AS REFLECTIVE COATING A67-19794
- FAR FIELD PATTERN OF SHEET-LIKE LASER BEAM FROM ELECTRON BOMBARDED CD S AND ZN O SINGLE CRYSTALS A67-19798
- TRAVELING WAVE EXCITATION OF HIGH POWER NITROGEN AND NEON LASERS WITH VELOCITY MATCHING THAT OF STIMULATED EMISSION A67-20093
- TIME BEHAVIOR OF PULSED WATER VAPOR LASER, NOTING SPIKING FROM FAR IR EMISSION LINES A67-20095
- PICOSECOND LASER PULSE WIDTHS MEASUREMENT BY METHOD USING SPECIAL SYMMETRY PROPERTIES OF SECOND HARMONIC GENERATION AT GA AS CRYSTAL SURFACE A67-20097
- LASER ACTION IN ZINC SELENIDE CRYSTALS AT 4600 ANGSTROMS PREPARED UNDER HIGH PRESSURE IN CLOSED CONTAINER BY GAS PHASE REACTION AND FOLLOWING CRYSTALLIZATION A67-20183
- TIME BEHAVIOR OF LIGHT EMITTED FROM MANY-ELEMENT LASER - MICROWAVE MODELS OF LASER RESONATORS ASR-1 N67-10283
- PHYSICAL PROPERTIES AND OPERATING CHARACTERISTICS OF EUROPIUM AND RARE EARTH CHELATE LASERS TR-66-052.13 N67-12533
- HIGH POWER LASER RESEARCH - LASER MATERIAL EVALUATION, STIMULATED OUTPUT AND Q-SWITCHING, SELF-FOCUSING IN LIQUIDS, AND FLASH LAMP SPECTROSCOPY NRL-6444 N67-12645
- ENERGY TRANSFER IN ACTIVATED GLASSES AND HIGH POWER LASER EMISSION N67-12646
- LOW POWER WIDE BANDWIDTH LASER MODULATORS N67-13069
- LASER SYSTEM FOR DETERMINING SKY BACKSCATTERING RADIATION - SUBSYSTEM CIRCUIT DIAGRAMS NASA-CR-80441 N67-13120
- CALCULATIONS AND EXPERIMENTS TO DETERMINE ION WAVE INSTABILITY IN STEADY STATE DISCHARGE, LASER BREAKDOWN IN PLASMA, AND MICROWAVE SCATTERING FROM STANDING PLASMA WAVES N67-14628
- LASER APPLICATIONS WITH INTERFEROMETERS, HOLOGRAPHY, RADIOMETRY, CALORIMETRY, AND NOISE DETECTION N67-17362
- LATTICE IMPERFECTION**
- ETCHING METHODS TO VISUALIZE LATTICE DISLOCATIONS AND GRAIN BOUNDARIES IN CZOCHRALSKI GROWN CALCIUM TUNGSTATE CRYSTALS DOPED WITH NEODYMIUM FOR LASER APPLICATION A67-19565
- LATTICE VIBRATION**
- RUBY LASER-INDUCED EFFECT OF PULSED PRESSURE ON KDP CRYSTAL SURFACE AND THERMAL BULK EFFECT ON EXCITATION OF ULTRASONIC OSCILLATION IN CRYSTAL A66-40318
- PHASE AND AMPLITUDE FLUCTUATION OF GAS AND SOLID STATE LASERS, ACCOUNTING FOR NOISE CAUSED BY PUMPING, INCOHERENT DECAY, LATTICE VIBRATIONS AND ATOMIC COLLISIONS A67-14949
- LEAD COMPOUND**
- LEAD AZIDE AND PENTAERYTHRIT TETRANITRATE EXPLOSION TRIGGERED BY LASER RADIATION A67-19315
- LEAD SELENIDE**
- SPONTANEOUS AND COHERENT EMISSION FROM LEAD SULFIDE, TELLURIDE AND SELENIDE DIODE LASERS IN ORIENTED MAGNETIC FIELD, DETERMINING BAND EDGE PARAMETERS FROM SPIN-SPLIT ZERO ORDER LANDAU LEVEL TRANSITIONS A66-26185
- LEAD SULFIDE**
- SPONTANEOUS AND COHERENT EMISSION FROM LEAD SULFIDE, TELLURIDE AND SELENIDE DIODE LASERS IN ORIENTED MAGNETIC FIELD, DETERMINING BAND EDGE PARAMETERS FROM SPIN-SPLIT ZERO ORDER LANDAU LEVEL TRANSITIONS A66-26185
- LEAD TELLURIDE**
- SPONTANEOUS AND COHERENT EMISSION FROM LEAD SULFIDE, TELLURIDE AND SELENIDE DIODE LASERS IN ORIENTED MAGNETIC FIELD, DETERMINING BAND EDGE PARAMETERS FROM SPIN-SPLIT ZERO ORDER LANDAU LEVEL TRANSITIONS A66-26185
- MULTIPHOTON PLASMA PRODUCTION AND STIMULATED RECOMBINATION RADIATION IN LEAD TELLURIDE, CONSIDERING ELECTRON-HOLE PAIR PRODUCTION RATE A66-31884
- COHERENT AND SPONTANEOUS EMISSION FROM LEAD-TIN TELLURIDE ALLOYS UPON EXCITATION BY GA AS DIODE LASER, NOTING BAND STRUCTURE OF ALLOY SYSTEM A66-34159
- LENS**
- INEXPENSIVE CARBON DIOXIDE MOLECULAR GAS LASER USING PLANO-CONCAVE EYEGLASS LENSES A67-10827
- GAS LENS FOCUSING OF LIGHT BEAMS, USING HIGHLY TRANSPARENT GAS WITH WEAKLY VARYING REFRACTIVE INDEX TO GUIDE COHERENT TRANSMISSION WITH SMALL LOSSES A67-19789
- LENS DESIGN**
- LASER MIRROR DESIGN IN LENS FORM FOR DECOUPLING DIFFRACTION LIMITED PARALLEL BEAM, BASED ON THEOREMS CONCERNING GAUSSIAN BEAM IMAGING AND BEHAVIOR A67-17327
- LIDAR**
- OPTICAL INSTRUMENTATION RADAR FOR REAL-TIME POSITIONAL DATA ON HIGH-SPEED COOPERATIVE TARGETS A66-25654
- ATMOSPHERIC OBSERVATION WITH ADVANCED LIGHT RADAR, NOTING EQUIPMENT CHARACTERISTICS, MOLECULAR SCATTERING MECHANISM, ETC A66-26133
- HIGH POWERED Q-SWITCHED RUBY LASER / LIDAR/ FOR METEOROLOGICAL APPLICATION, NOTING SYSTEM EQUATIONS, DESIGN, OPERATION, ETC A66-26548
- OPTICAL COMMUNICATION USING LASER TECHNIQUES A66-26918
- LASER DOPPLER VELOCIMETER FOR MEASURING LOCALIZED FLOW VELOCITIES IN LIQUIDS A66-27053
- COHERENT TRANSMISSION OF OPTICAL RADAR FROM LASER SOURCE AND USE OF RF SUBCARRIERS PLACED ON OPTICAL BEAMS FOR WIDEBAND COMMUNICATIONS PURPOSES A66-28404
- PRECISION AUTOMATIC TRACKING USING CW HE- NE LASER, NOTING PERFORMANCE AND APPLICATION A66-28448
- ATMOSPHERIC EXPLORATION WITH LIDAR, NOTING HIGH RESOLUTION AND SENSITIVITY A66-28600
- MEASUREMENT OF DISTANCE TO MOON BY OPTICAL RADAR, DISCUSSING RUBY LASER/PHOTOMULTIPLIER APPARATUS AND PROCEDURE A66-30291
- GALLIUM ARSENIDE DIODE LASER AS PULSED IR SOURCE

- FOR EXPERIMENT AND DESIGN CONSIDERATIONS FOR RADAR INDICATION OF CLOUD HEIGHT AND VISIBILITY A66-33616
- OPTICAL TECHNIQUES IN LASER DETECTION SYSTEMS A66-37439
- DETECTING CONCENTRATION OF NITRIC OXIDE IN METASTABLE STATE IN UPPER ATMOSPHERE, USING GIANT-PULSE RAMAN LASER SOURCES A66-43022
- CIRRUS CLOUD COVER OBSERVATION CAPABILITY AND PERFORMANCE SPECIFICATIONS FOR METEOROLOGICAL SATELLITE LIDAR NASA-CR-76087 N66-29977
- DETECTION OF CEMENT DUST CLOUDS WITH PULSED RUBY LIDAR UCRL-13204 N66-32847
- DOPPLER LASER RADAR SYSTEM FOR DETECTION OF CLEAR AIR TURBULENCE SID-66-450 N66-35122
- LASER OPTICAL RADAR USED FOR CLEAR AIR TURBULENCE DETECTION AFCL-66-115 N66-38204
- AVALANCHE TRANSISTOR PULSER DESIGNED TO DRIVE GA AS RADAR-LASER DIODE A67-12964
- RADIO LOCATION BY COHERENT LIGHT WITH QUANTUM STRUCTURE A67-13283
- LASER RADAR RETURNS FROM LOWER TROPOSPHERE COMPARED WITH VERTICAL OZONE DISTRIBUTIONS INDICATE INVERSE RELATIONSHIP A67-14676
- CLEAR AIR TURBULENCE DETECTION WITH LASER RADAR, NOTING AIRBORNE EQUIPMENT AND RESULTS A67-15304
- TRAVELING WAVE RUBY LASER AS RADAR TRANSMITTER NOTING POWER GAIN, COHERENCE, FREQUENCY SHIFT AND SINGLE MODE OF OPERATION A67-16657
- SMALL LASER RADAR APPLIED TO METEOROLOGICAL STUDIES PMR-TM-66-6 N67-12294
- LOW NOISE AMPLIFIERS, LASER RADAR OPTICS, GAS LASERS AND HOLOGRAPHY, AND MICROMINIATURIZED SOLID STATE DEVICES FOR RADIO ELECTRONICS N67-16009
- GALLIUM ARSENIDE LASER RADAR AND RANGEFINDING AT ROOM TEMPERATURE HDL-TM-66-13 N67-16144
- LIFETIME**
- TRANSITION PROBABILITIES AND LIFETIMES IN IONIZED ARGON GAS LASERS A66-26207
- FLUORESCENT LIFETIMES OF NEODYMIUM, YTTERBIUM AND SAMARIUM INCORPORATED IN ORDERED PEROVSKITE-TYPE COMPOUNDS DETERMINED, NOTING CRYSTAL STRUCTURE POTENTIAL FOR LASER EMISSION A66-27976
- EXTENSION OF PAPER ON SATURABLE ABSORBER GIANT PULSE LASERS TO INCLUDE EFFECTS OF FINITE ABSORBER LIFETIME ON PULSE PARAMETERS, NOTING PUMP ROLE A67-18148
- LIGHT, SPEED OF**
- SHORT PULSE Q-SWITCHED LASER WITH VARIABLE PULSE LENGTH A67-16641
- LIGHT ABSORPTION**
- LIGHT ABSORPTION BY FREE CURRENT CARRIERS ROLE IN KINETIC EQUATIONS OF SEMICONDUCTOR LASER/RADIATION SYSTEM A66-34691
- EFFECTIVE BRIGHTENING OF LASER RADIATION PROPAGATING IN STRONGLY ABSORBING MEDIUM A66-39770
- PULSED LASER Q-FACTOR MODULATION USING NONLINEAR RESONATOR FUNCTIONS IN ABSORBING MEDIUM A67-13135
- LIGHT ABSORPTION BY FREE CURRENT CARRIERS ROLE IN KINETIC EQUATIONS OF SEMICONDUCTOR LASER/RADIATION SYSTEM A67-14376
- NATURE OF EXCITED STATE RESULTING FROM TWO-QUANTUM ABSORPTION ASSOCIATED WITH FLUORESCENCE IN ANTHRACENE PRODUCED BY RUBY LASER A67-16130
- LUMINESCENCE SPECTRUM OF CU CL AT LOW TEMPERATURES EXCITED BY DOUBLE PHOTON ABSORPTION FROM HIGH INTENSITY LASER BEAM A67-17822
- LIGHT AMPLIFIER**
- OPTICAL LENGTH VARIATIONS IN LASER AMPLIFIERS DETERMINED DURING PUMPING AND AMPLIFICATION, USING INTERFEROMETRY A66-25999
- LIGHT FREQUENCY MULTIPLIERS FOR NONLINEAR OPTICAL EFFECTS AT VARIOUS WAVELENGTHS, CONSIDERING FOCUSING, LASER BEAM FINITE DIVERGENCE, AIR BREAKDOWN, STIMULATED RAMAN EMISSION, ETC A66-26146
- LIGHT PULSE SHAPE VARIATION OF LASER WITH MODULATED Q-FACTOR DURING NONLINEAR AMPLIFICATION A66-27183
- REGENERATIVE HELIUM-NEON LASER WITH AMPLIFICATION COEFFICIENT OF 1000 A66-29352
- REGENERATIVE HELIUM-NEON LASER WITH AMPLIFICATION COEFFICIENT OF 1000 A66-37357
- LASER AMPLIFIER THEORY USING FABRY-PEROT INTERFEROMETER AND LAPLACE TRANSFORM FOR OBTAINING TRANSIENT SOLUTIONS IN ADDITION TO STEADY STATE SOLUTIONS A66-39224
- NONLINEAR AMPLIFICATION OF LIGHT PULSE PASSING THROUGH LASER OPERATING AT SATURATION REGIME A66-39542
- SPECTRAL HOLE BURNING AND CROSS RELAXATION EFFECTS ON STEADY STATE GAIN SATURATION OF LASER AMPLIFIER WITH INHOMOGENEOUSLY BROADENED LINEWIDTH A66-40098
- RADIATIVE POWER AMPLIFICATION OF HE-NE LASER WITH NEARLY CONFOCAL RESONATORS A66-41453
- LINEARLY AND CIRCULARLY POLARIZED FIELDS IN LASER AMPLIFIER INTERACTION WITH AXIAL MAGNETIC FIELD, EMPHASIZING COMBINATION TONE PRODUCTION A66-41624
- I R GA AS LASER AMPLIFIER WITH GAINS AS HIGH AS 2000, OUTPUT POWERS OF 150 MW AND SATURATION OCCURRING WITH CURRENT INCREASE AT LOW LIGHT LEVELS A66-42562
- LIGHT PULSE SHAPE VARIATION OF LASER WITH MODULATED Q-FACTOR DURING NONLINEAR AMPLIFICATION A66-42727
- QUANTUM GENERATORS AND COHERENT LIGHT AMPLIFIERS JPRS-36295 N66-29984
- RADIATIVE POWER AMPLIFICATION OF HE-NE LASER WITH NEARLY CONFOCAL RESONATORS A67-14190
- MULTIGIGAWATT OSCILLATOR-AMPLIFIER RUBY LASER SYSTEM FOR HIGH TEMPERATURE PLASMA RESEARCH ASME PAPER 66-WA/ENER-2 A67-15371
- BOOK ON LASERS, LIGHT AMPLIFIERS AND OSCILLATORS NOTING OPTICAL RESONATORS, OPTICAL PUMPING, PULSED LASERS, ETC A67-19469
- LIGHT COMMUNICATION DEVICE**
- OPTICAL COMMUNICATION FOR MARS EXPLORATION WITH OUTLINE OF LASER MODULATORS AND ANTENNAS A66-25251
- SOLAR NOISE IN OPTICAL COMMUNICATIONS, BACKGROUND RADIATION DEPENDENCE ON DETECTOR APERTURE, NOISE POWER AND APPLICATION TO GA AS DIODES AND GAS

- LASERS A66-25833
- F M LASER AND OPTICAL HETERODYNES IN OPTICAL COMMUNICATION SYSTEMS A66-26004
- OPTICAL COMMUNICATION USING LASER TECHNIQUES A66-26918
- MULTIPLE SCATTERING EFFECTS ON PROPAGATION OF COHERENT OPTICAL SIGNALS STUDIED FOR LASER COMMUNICATIONS APPLICATION A66-28580
- LASER COMMUNICATION BY OPTICAL BEAM WAVEGUIDE A66-30594
- COMMUNICATION SYSTEMS AT MICROWAVE AND OPTICAL FREQUENCIES FOR FUTURE MARS MISSIONS A66-33793
- SPACE COMMUNICATION REQUIREMENTS USING LASERS AND MICROWAVES IN MANNED MARS FLIGHTS AIAA PAPER 65-324 A66-33794
- ACQUISITION AND REACQUISITION IN SPACECRAFT-SPACECRAFT AND SPACECRAFT-TO-EARTH COMMUNICATIONS USING LASER SYSTEMS A66-33795
- SYSTEM DESIGN ANALYSIS OF LASER METHODS OF DEEP SPACE COMMUNICATION, EXAMINING LOCAL HETERODYNE SYSTEM / LHS/, DIRECT DETECTION SYSTEM / DDS/ AND TRANSMITTED REFERENCE SYSTEM A66-35666
- BOOK ON LASER RECEIVERS COVERING NOISE PERFORMANCE, ATMOSPHERIC EFFECTS, DETECTION TECHNIQUES, HARDWARE AND SYSTEMS AVAILABLE, OPTICAL COMMUNICATION IN VISIBLE AND IR SPECTRUM, ETC A66-36060
- OPTICAL COMMUNICATION SYSTEMS, DISCUSSING AVAILABLE EQUIPMENT, TRANSMISSION CHARACTERISTIC, LACK OF LONG DISTANCE OPERATION RELIABILITY, ETC A66-42805
- FUTURE PROSPECTS OF LASER AS LIGHT COMMUNICATIONS DEVICE AND RADIO RECEIVER JPRS-36111 N66-29552
- SYSTEM DESIGN ANALYSIS OF LASER METHODS OF DEEP SPACE COMMUNICATION, EXAMINING LOCAL HETERODYNE SYSTEM / LHS/, DIRECT DETECTION SYSTEM / DDS/ AND TRANSMITTED REFERENCE SYSTEM A67-17635
- LIGHT EMISSION**
- IN AS LASER EMISSION, DISCUSSING RADIATIVE TRANSITIONS, COHERENT EMISSION FROM IN AS DIODES, RECOMBINATION MECHANISMS IN IR RADIATION SPECTRA, ETC A66-25065
- LASER ACTION IN GALLIUM ANTIMONIDE DIODES, EXAMINING EMITTED LIGHT SPECTRUM VS INJECTED CURRENT, TEMPERATURE EFFECT, RADIATIVE EFFICIENCY, ETC A66-26184
- CORRELATIONS AND INTENSITY FLUCTUATIONS IN LIGHT FROM INDIVIDUAL LASING AND NONLASING MODES OF CW GA AS LASER AND THRESHOLD NOISE CHANGE IN LASER EMISSION A66-26210
- ABSOLUTE FLUX MEASUREMENT FOR PULSED AND TRIGGERED LASERS REQUIRING ONLY QUANTUM RECEIVERS A66-26375
- INITIAL PULSE IN LUMINOUS EMISSION OF DISCHARGE LASER, USING PHOTOMULTIPLIER PRECEDED BY MOBILE IRIS, DETERMINING GEOMETRICAL DISTRIBUTION OF DISCHARGE BRIGHTNESS A66-31209
- FORCED EMISSION FROM ELECTRON-EXCITED CADMIUM SELENIDE A66-35788
- SEMICONDUCTOR LIGHT EMISSION MECHANISMS EXAMINED INCLUDING WAVELENGTH EMITTED, WIDTH OF RAY EMITTED AND EFFICIENCY OF EMISSION A66-36263
- REPLACING HEATED TUNGSTEN FILAMENT AND IR FILTER BY GA AS ELECTROLUMINESCENT DIODE WITHOUT FILTER FOR IR ILLUMINATION A66-36266
- TIME VARIATION IN INTENSITY OF LIGHT EMITTED FROM
- CW GA AS LASER DIODES A67-10243
- LASER INDUCED BREAKDOWN OF COMPLEX ORGANIC MOLECULES IN VAPOR STATE, NOTING EMISSION ACCOMPANIED BY FORMATION OF PARTIALLY DISSOCIATED HOT GAS A67-12451
- OPTICALLY PUMPED RUBY NOTING ABSORPTION AND EMISSION SPECTRUM, TRANSITION STAGES AND PHONON TERMINATED AMPLIFICATION A67-16658
- TIME BEHAVIOR OF LIGHT EMITTED FROM MANY-ELEMENT LASER - MICROWAVE MODELS OF LASER RESONATORS ASR-1 N67-10283
- LIGHT INTENSITY**
- STEADY STATE VARIATION OF LIGHT INTENSITY WITH DISTANCE FOR MONOCHROMATIC LIGHT, NOTING DEPENDENCE OF ABSORPTION COEFFICIENT ON DEGREE OF EXCITATION OF ELECTRONIC SYSTEM A66-26183
- THRESHOLD STUDIES OF ION LASER OSCILLATIONS IN SULFUR AND SATURATION AND QUENCHING OF LASER INTENSITY A66-26209
- STATISTICAL ANALYSIS OF LIGHT FIELDS CREATED BY SUPERPOSITION OF LASER LIGHT AND CHAOTIC LIGHT A66-29815
- LIGHT ENERGY MEASUREMENTS MADE WITH ARGON BOMB USED AS CHEMICALLY POWERED LASER PUMP A66-35388
- REPLACEMENT OF POISSON BY POLYA DISTRIBUTION IN CALCULATING LASER INTENSITY THRESHOLD NECESSARY TO INDUCE IONIZATION BREAKDOWN IN GASES A66-39715
- ATMOSPHERIC TURBULENCE EFFECT ON LASER BEAM INTENSITY DISTRIBUTION A66-41030
- ATMOSPHERIC TURBULENCE EFFECT ON FREQUENCY SPECTRA OF LIGHT INTENSITY FLUCTUATIONS EXAMINED, USING HE- NE LASER A66-41031
- QUANTITATIVE PHOTOGRAPHIC DETERMINATIONS OF LASER BEAM POWER DENSITY DISTRIBUTIONS AND Q-SWITCHED RUBY OSCILLATOR-AMPLIFIER SYSTEM DIVERGENCE CHARACTERISTICS A66-41032
- LINEARIZED POPULATION RATE EQUATIONS AND QUANTUM NOISE SOURCES USED TO CALCULATE SPECTRA OF INTRINSIC SECOND MOMENT INTENSITY FLUCTUATIONS IN 3- AND 4-LEVEL CW LASER OSCILLATORS A66-42548
- APPROXIMATE ABSOLUTE VALUES OF PUMPING POWER, THRESHOLD POWER AND CRITICAL EXCESS POPULATION FOR RUBY LASER DETERMINED FROM RELATIVE FLASH TUBE INTENSITY MEASUREMENTS A67-10245
- INTENSE PULSE GENERATION AT 5300 ANGSTROMS BY FREQUENCY DOUBLING IN Q-SWITCHED AND GLASS LASER AND POSSIBILITY OF GENERATING PARTICULAR HARMONICS A67-10759
- UNCOUPLED INTENSITY PEAKS IN LASER EMISSION A67-13132
- NEODYMIUM-GLASS LASER USING SPONTANEOUS AMPLIFIED EMISSION IN NONRESONANT SYSTEM TO OBTAIN HIGH BRIGHTNESS OUTPUT PULSE A67-15100
- FRACTION OF LUMINOUS ENERGY CAPTURED BY OPTICAL PUMPING LASERS IN GIVEN GEOMETRICAL CONFIGURATION, OBTAINING FUNCTIONING THRESHOLD DEPENDING ONLY ON CRYSTAL A67-15498
- STEADY STATE INTENSITY FLUCTUATIONS AND STATISTICS OF LASER OPERATING ABOVE THRESHOLD A67-15776
- COHERENCE AND FLUCTUATIONS OF LIGHT INCLUDING STELLAR CORRELATION INTERFEROMETRY, PHOTON BUNCHING, ETC A67-17569
- LASER SPECTROSCOPY, DISCUSSING ADVANTAGES, PRECISION ATTAINABLE, LINE SHAPE AND POSITION

- MEASUREMENTS A67-19087
- LIGHT MODULATOR**
- NEODYMIUM DOPED YAG CRYSTAL AND LITHIUM META  
NIOBATE AS CW LASER MATERIALS AND POTASSIUM  
TANTALUM NIOBATE AS OPTICAL MODULATOR MATERIAL A66-25518
- I R AND VISIBLE HELIUM-NEON LASER MODULATION USING  
FARADAY ROTATION IN YIG A66-26881
- DETECTION OF VERY LOW LEVELS OF MODULATION ON  
LASER BEAM TO DETERMINE PERFORMANCE OF MICROWAVE  
LIGHT MODULATORS A66-29682
- DEMODULATION METHOD IN WHICH PHASE MODULATION OF  
LASER BEAM IS CONVERTED TO AMPLITUDE MODULATION  
BY AUTOCORRELATION A66-30616
- HELIUM-NEON LASER MODULATION BY POSITIVE AND  
NEGATIVE VOLTAGE PULSES A66-31559
- RETARDATION-TYPE LASER MODULATORS, EXAMINING  
DRIVING POWER, TRANSMISSION AND DYNAMIC RANGE A66-32820
- LASER LIGHT MODULATION BY POCKELS OR KERR EFFECT  
FOR APPLICATION TO TELECOMMUNICATIONS SYSTEM,  
EXAMINING ELECTRICAL BIREFRINGENCE MODULATION A66-36262
- 10.6 MICRON OUTPUT OF CARBON DIOXIDE- HE LASER  
MODULATED, USING BRAGG DIFFRACTION FROM  
LONGITUDINAL ACOUSTIC WAVES IN TE A66-42251
- GA AS CRYSTAL AS ELECTRO-OPTIC MODULATOR AT 10.6  
MICRONS DUE TO SMALL CARRIER ABSORPTION, FREEDOM  
FROM INTERBAND TRANSITIONS AND HIGH RESISTIVITY A66-42553
- ELECTRO-OPTIC LIGHT MODULATION USING POCKEL AND  
KERR EFFECTS IN CRYSTALS FOR COMMUNICATIONS  
APPLICATIONS, USING LASERS A66-42811
- HORIZONTAL DEFLECTION IN TV DISPLAY PRODUCED BY  
BRAGG REFLECTION OF LASER LIGHT BY ULTRASONIC  
WAVES IN WATER A66-42816
- LASER TECHNOLOGY - MATERIALS, CONTROL, FUNCTIONS,  
DEMODULATION, AND PRACTICAL APPLICATIONS  
NASA-TT-F-10201 N66-33688
- MODULATION AND SCANNING OF COHERENT LIGHT FOR  
APPLICATION TO SIMULATION DISPLAY GENERATION  
AMRL-TR-66-9 N66-39473
- KERR CELL PROPERTIES NOTING FOUR-ELECTRODE CELL  
GIVING FREQUENCY SHIFT OF 60 MC FOR LASER BEAM A67-19552
- ELECTRO-OPTIC LIGHT MODULATORS OF LASER BEAMS  
NASA-TN-D-3678 N67-10788
- LOW POWER WIDE BANDWIDTH LASER MODULATORS  
N67-13069
- LIGHT PRESSURE**
- DUST PARTICLES IN LASER CAVITY OBSERVED FOR  
ANGULAR STABILIZATION AND CONSTANT VELOCITIES A66-26594
- MOMENTUM TRANSFER CAUSED BY FOCUSING LASER GIANT  
PULSE ON SURFACE IN VACUUM INVESTIGATED FOR BE,  
C, AL, ZN, AG AND W A66-35418
- LIGHT SCATTERING**
- NONLINEAR LIGHT SCATTERING IN PRESSURIZED METHANE,  
NOTING DISPLACEMENT OF SPECTRAL LINE FROM LASER  
FREQUENCY A66-26148
- CROSS SECTION FOR INELASTIC SCATTERING OF  
ELECTROMAGNETIC RADIATION BY ELECTRON DENSITY  
FLUCTUATIONS IN ANISOTROPIC SOLIDS, USING LASER  
SOURCES, INVESTIGATING LANDAU AND COLLISION  
DAMPING OF PLASMONS A66-26153
- STIMULATED BRILLOUIN SCATTERING IN QUARTZ  
ANALYZED, NOTING AMPLIFICATION, STOKES WAVE
- GENERATION AND RUBY GAIN A66-26165
- VELOCITY AND LIFETIME OF MICROWAVE THERMAL PHONONS  
IN LIQUIDS AND SOLIDS DETERMINED BY SPECTRUM OF  
LIGHT SCATTERING FROM LASER ILLUMINATED SAMPLE A66-26166
- HE- NE LASER HOMODYNE SPECTROMETER OBSERVATION OF  
BROADENING OF SPECTRAL PROFILE OF LIGHT SCATTERED  
FROM CARBON DIOXIDE NEAR CRITICAL TEMPERATURE AND  
DENSITY DUE TO DENSITY FLUCTUATIONS A66-26168
- LASER RADIATION COHERENCE PROPERTY DETERIORATION  
AND MOLECULAR SCATTERING DURING PROPAGATION  
THROUGH TURBULENT ATMOSPHERE A66-27131
- MULTIPLE SCATTERING EFFECTS ON PROPAGATION OF  
COHERENT OPTICAL SIGNALS STUDIED FOR LASER  
COMMUNICATIONS APPLICATION A66-28580
- OPTICAL BEAM SCATTERING OF GAS LASER FOR  
MEASUREMENT OF PHOTOELASTIC CONSTANTS AND  
APPLICATION TO LITHIUM NIOBATE A66-28692
- C AT DETECTION FROM DOPPLER SHIFT IN LASER LIGHT  
BACKSCATTERED FROM ATMOSPHERIC AEROSOL A66-28930
- TWO-QUANTA ABSORPTION AND SCATTERING LOSS IN  
POWERFUL LASER A66-29350
- STATISTICAL ANALYSIS OF LIGHT FIELDS CREATED BY  
SUPERPOSITION OF LASER LIGHT AND CHAOTIC LIGHT A66-29815
- SCATTERING OF LIGHT FROM PULSED RUBY LASER BY  
PLASMA JET, NOTING CROSS SECTION, ELECTRON-PHONON  
INTERACTION, ETC A66-30139
- COOPERATIVE INTERACTIONS BETWEEN IONS AND  
ELECTRONS IN FORWARD SCATTERING OF RUBY LASER BEAM  
FROM PLASMA A66-30153
- RECORDING OF LIGHT-INDUCED LIGHT SCATTERING USING  
LASER BEAM, CALCULATING CROSS SECTION OF PHOTON-  
PHOTON SCATTERING A66-31175
- GRANULARITY CHARACTERISTICS OF SCATTERED LIGHT  
FROM HELIUM-NEON LASER DIRECTED ONTO MOVING  
SURFACE A66-31725
- NONLINEAR SCATTERING OF RUBY LASER BEAM BY PLASMA  
AT SECOND AND THIRD HARMONIC A66-32433
- UPPER ATMOSPHERIC LIGHT SCATTERING OF VERTICALLY  
FIRED RUBY-LASER PULSE A66-33348
- ELECTRON TEMPERATURE AND CONCENTRATION IN DC  
PLASMA ARC DETERMINED FROM THOMSON SCATTERING  
OF LASER RADIATION A66-33840
- SOVIET AND FOREIGN PAPERS ON PLASMA DIAGNOSTICS  
BY SCATTERING OF LASER BEAMS AT PLASMA ELECTRONS A66-34967
- C W HE- NE LASER MEASUREMENT OF LIGHT SCATTERING  
IN CRYSTALS NOTING LASER OUTPUT, PERFORMANCE AND  
CRYSTAL IMPERFECTIONS A66-35402
- COOPERATIVE SCATTERING OF LASER LIGHT BY THETATRON  
PLASMA A66-35489
- TWO-QUANTA ABSORPTION AND SCATTERING LOSS IN  
POWERFUL LASER A66-37355
- CONTINUOUS WAVE GAS LASER AS LIGHT SOURCE IN  
SCATTERED LIGHT STATIC PHOTOELASTICITY A66-37443
- LIGHT REFLECTION FROM SHOCK WAVES CLARIFIED  
THROUGH PROPAGATION IN SHOCK TUBES, USING GAS  
LASER A66-40012
- CRYSTAL DEFECTS AND PERFORMANCE IN RUBY LASER,  
MEASURING COHERENCE FUNCTION OF LIGHT AND OUTPUT  
ENERGY AND CRYSTAL HOMOGENEITY A66-41291
- CONFIGURATIONS FOR REALIZATION OF MULTIPLE LASER

LIGHT SCATTERING USING MICROWAVE ACOUSTIC WAVES  
AND TWO PORRO PRISMS A66-42636

OPTICAL HETERODYNE RECEIVER ANTENNA PROPERTIES,  
NOTING EFFECTIVE APERTURE OF CAPTURE CROSS SECTION  
VS DIRECTIONAL TOLERANCE AND DETECTION OF DOPPLER  
SHIFTS IN LIQUID SCATTERED COHERENT LIGHT  
A66-42809

NONLINEAR OPTICS EMPHASIZING PARAMETRIC  
OSCILLATION, SELF-FOCUSING AND TRAPPING OF LASER  
BEAMS AND STIMULATED RAMAN, RAYLEIGH AND  
BRILLOUIN SCATTERING, USING MAXWELL EQUATIONS  
AND ELECTRIC DIPOLE APPROXIMATION  
A66-42810

LASER BEAM DETERIORATION AND STIMULATED RAMAN  
EFFECT  
AD-628074 N66-24738

LIGHT BACKSCATTERING EXPERIMENT IN LASER PROBING  
STUDIES OF ATMOSPHERIC LAYER ABOVE 100 KM  
NASA-CR-74730 N66-24998

LIGHT SCATTERING TECHNIQUES FOR CRYSTAL EVALUATION  
AFCRL-66-119 N66-26436

RUBY LASER WITH NONRESONANT FEEDBACK BY USING  
VOLUME OR SURFACE SCATTERER N66-28924

NEW CLASS LIGHT FILAMENT IDENTIFIED IN RAMAN  
RADIATION OF INTENSE RUBY LASER BEAM  
NASA-TM-X-57831 N66-33863

FREQUENCY DISTRIBUTION MEASUREMENTS OF RUBY LASER  
LIGHT SCATTERED BY THETATRON PLASMA  
CLM-P-104 N66-35301

SCATTERED LIGHT SPECTRUM IN THETATRON PLASMA,  
NOTING ONSET OF ION WAVE INSTABILITY  
A67-10248

RUBY LASER WITH SCATTERING INDUCED FEEDBACK AND  
ABSENCE OF RESONANCE TYPE OSCILLATIONS  
A67-10740

THERMALIZATION RATE OF HIGHLY IONIZED PLASMA WITH  
INITIALLY HOT IONS AND COLD ELECTRONS, USING LASER  
SCATTERING TO OBSERVE TIME VARIATION OF ELECTRON  
TEMPERATURE A67-10912

SCATTERING OF PARTIALLY COHERENT RADIATION BY  
NEUTRAL MOLECULES FORMULATED AS RANDOM PROCESS  
A67-12096

RUBY LASER FREQUENCY CONVERSION TECHNIQUE BY LASER  
BEAM SCATTERING AND MIXING OF COMBINED FREQUENCIES  
A67-13094

ELECTRON TEMPERATURE AND CONCENTRATION IN DC  
PLASMA ARC DETERMINED FROM THOMSON SCATTERING OF  
LASER RADIATION A67-13209

LASER BACKSCATTER SIGNATURES AND TRANSMISSIVITY  
OVER HORIZONTAL AND SLANT PATHS WITH RESPECT TO  
MEASURING EXTINCTION COEFFICIENTS OF SCATTERING  
MEDIA A67-14677

DATA RECORD AND READOUT SYSTEMS DEPENDENCE ON  
PRECISE SPOT AND LINE SCAN METHODS, USING  
DIFFRACTION LIMITED SPOTS OF LASER GENERATED LIGHT  
A67-15321

DIFFRACTION LIMITED PERFORMANCE ACHIEVED FOR  
FLYING SPOT RECORDING AND READOUT, USING  
CONCENTRIC OPTICAL SYSTEM, APPLIED TO LASER  
SCANNER A67-15322

POLARIZATION OF LIGHT SCATTERED FROM HE- NE LASER  
BEAM, APPLYING QUANTUM THEORY TO FORMULA FOR  
DEPOLARIZATION RATIO A67-15624

DEGENERATE STIMULATED FOUR-PHOTON INTERACTION AND  
FOUR-WAVE PARAMETRIC AMPLIFICATION OBSERVED IN  
RUBY LASER AND LIQUID CELL ARRANGEMENTS  
A67-16379

PROPERTIES OF SELF-TRAPPED LIGHT FILAMENTS NOTING  
STIMULATED RAMAN EMISSION AND CREATION,

CONTAINMENT AND TERMINATION MECHANISMS  
A67-16648

INELASTIC SCATTERING OF CARBON DIOXIDE LASER  
RADIATION BY MOBILE LANDAU-LEVEL ELECTRONS IN N-  
IN SB A67-17723

STATISTICAL DETERMINATION OF CORRELATION FUNCTIONS  
OF PLASMA SCATTERED COHERENT LIGHT  
A67-17824

BIBLIOGRAPHY ON LASERS COVERING MODES, SCATTERING  
MECHANISMS, QUANTUM ELECTRODYNAMICS, MATTER-  
RADIATION INTERACTION, PLASMA, HOLOGRAPHY AND  
OPTICS A67-17890

LIGHT SOURCE  
PHOTOELECTRON COUNTS OF PHOTOMULTIPLIER  
ILLUMINATED BY GAS LASER LIGHT SOURCE  
A66-26211

PHASE LOCKING OF ONE LASER TO ANOTHER BY DIRECT  
INJECTION OF FIRST LASER BEAM INTO SECOND LASER  
CAVITY A66-26593

MONOGRAPH ON LASERS INCLUDING GAS LASERS, RUBY  
LASERS, GIANT-PULSE TECHNIQUES, OSCILLATION MODES,  
ETC A66-26961

LATERAL SHEARING INTERFEROMETER WITH GAS-LASER  
LIGHT SOURCE FOR TESTING LARGE OPTICAL SYSTEMS  
A66-27320

NEAR- BOSE- EINSTEIN PROBABILITY DISTRIBUTION OF  
PHOTOELECTRON COUNTS PRODUCED BY HE- NE GAS LASER  
NARROW BAND GAUSSIAN LIGHT SOURCE OPERATING  
SLIGHTLY BELOW OSCILLATION THRESHOLD  
A66-30645

HIGH VOLTAGE PULSED ELECTRODELESS DISCHARGE IN  
RARE GAS AS LIGHT SOURCE FOR RUBY AND ND GLASS  
LASER EXCITATION AND OBSERVATION OF OUTPUT  
CHARACTERISTICS A66-31448

COHERENT GAS LASER LIGHT TO MEET REQUIREMENTS OF  
STREAK PHOTOGRAPHY FOR TIME-RESOLVED FLOW  
VISUALIZATION A66-32959

CONTINUOUS WAVE GAS LASER AS LIGHT SOURCE IN  
SCATTERED LIGHT STATIC PHOTOELASTICITY  
A66-37443

SCHLIENEN PHOTOGRAPHS OF PLASMA DISCHARGES IN  
PARALLEL PLATE RAIL TUBE, USING PULSED RUBY LASER  
AS LIGHT SOURCE A66-41510

MAGNETICALLY COMPRESSED PLASMA AS HIGH INTENSITY  
SOURCE OF NEAR UV AND VISIBLE RADIATION  
EXPERIMENTALLY STUDIED IN DYNAMIC PINCH  
A67-11880

HOLOGRAM COPYING METHOD USING GAS LASER AS LIGHT  
SOURCE A67-12513

SENSITIVITY OF OPTICAL SYSTEM USED IN SCHLIENEN  
SETUP IN DETERMINING QUALITY OF RECORDED  
INFORMATION A67-14606

BIBLIOGRAPHY ON LASERS COVERING MODES, SCATTERING  
MECHANISMS, QUANTUM ELECTRODYNAMICS, MATTER-  
RADIATION INTERACTION, PLASMA, HOLOGRAPHY AND  
OPTICS A67-17890

GAS LASER AS SOURCE OF ILLUMINATION, WITH  
ATTENTION TO ORIGIN OF AVENTURINE SPOTS ON SCREEN  
A67-19142

LIGHT TRANSMISSION  
ATMOSPHERIC TURBULENCE EFFECTS ON LASER BEAM  
PROPAGATION, NOTING BEAM CROSS SECTION, PHASE  
VARIATION, AM AND FM, ETC A66-27035

LIGHT TRANSMISSION THROUGH OPTICAL DIFFRACTION  
LATTICE CONSISTING OF MEDIUM IN EM FIELD OF  
LASER BEAM A66-28626

LINEAR INSTABILITY OF LASER PROPAGATION IN FLUID  
WITH COUPLING BETWEEN LIGHT AND MEDIUM  
A66-35034

- TRAJECTORIES OF LIGHT RAYS THROUGH MEDIUM  
SUBJECTED TO ACOUSTIC WAVES EXAMINED KNOWING THAT  
ACOUSTIC WAVES IN LASER MEDIUM FUNCTION AS OPTICAL  
WAVEGUIDE A66-38238
- SELF-INDUCED DIVERGENCE OF CONTINUOUS WAVE HE- NE  
LASER BEAMS WHEN TRAVERSING TRANSPARENT LIQUID,  
NOTING NONLINEAR EFFECT IN PROPAGATION OF LIGHT  
A66-39164
- UNDERWATER LIGHT TRANSMISSION FROM LASERS AND  
CONVENTIONAL LIGHT SOURCES N66-27790  
AD-631033
- DEGREE OF COHERENCE OF OPTICAL BEAM TRAVERSING  
ATMOSPHERIC MEDIUM INCLUDING SIMULATED FOG FOR  
DESIGN OF OPTICAL HETERODYNE RECEIVER N66-29972  
NASA-CR-76078
- QUENCHING OF ONE PULSED RUBY LASER OSCILLATION BY  
ANOTHER, NOTING COUPLED RATE EQUATIONS FOR STEADY  
STATE AND TRANSIENT BEHAVIOR A67-16682
- WAVELENGTH DEPENDENCE OF SPECTRUM OF LASER BEAMS  
TRAVERSING ATMOSPHERE A67-16793
- GAS LENS FOCUSING OF LIGHT BEAMS, USING HIGHLY  
TRANSPARENT GAS WITH WEAKLY VARYING REFRACTIVE  
INDEX TO GUIDE COHERENT TRANSMISSION WITH SMALL  
LOSSES A67-19789
- LIGHTING EQUIPMENT**  
RUBY LASER TO ILLUMINATE EXPLORER XXII SATELLITE  
WITH ENOUGH INTENSITY TO PHOTOGRAPH CUBE CORNER  
REFLECTORS LOCATED ON SATELLITE N66-31142  
AFCL-65-442
- LINE SHAPE**  
ACTUAL LINE SHAPE EXPECTED FROM ACCELERATING  
RADIATING ION, ERRORS DUE TO LORENTZIAN  
APPROXIMATION AND RESULTS FOR ION LASER TRANSITION  
IN RARE GAS LASERS A66-30181
- LINE SPECTRUM**  
X UV C, TI, MN, FE, NI, CU, ZN AND AR LINE  
SPECTRA AND CONTINUUM RADIATION SPECTRA IN PLASMAS  
PRODUCED BY FOCUSED RUBY LASER BEAM A66-39812
- REGENERATIVE RADIATION FROM NEON LINE IN HE- NE  
LASER, USING SPHERICAL REFLECTORS IN RESONATOR  
A67-13096
- LINEARIZATION**  
QUANTUM THEORY FOR NOISE IN STEADY STATE OF LASER  
OSCILLATOR ABOVE THRESHOLD, COMPARING  
SEMICLASSICAL AND QUANTIZED LINEAR THEORIES  
A66-25650
- LIQUID**  
MULTIPLE STIMULATED BRILLOUIN EMISSION EXHIBITED  
BY LIQUIDS EXPOSED TO PULSED RUBY LASER, NOTING  
SCATTERING EVENTS, STOKES ORDERS IDENTIFICATION  
AND ITERATION MECHANISM A66-26164
- BRILLOUIN SPECTRA OF ACETONE, ETHYL ALCOHOL,  
WATER, CARBON BISULFIDE, TOLUENE, AND CARBON  
TETRACHLORIDE USING HELIUM-NEON LASER AND  
PHOTOELECTRIC DETECTION N66-35529
- SELF-FOCUSING AND TRAPPING OF LASER BEAM IN LIQUID  
N67-12650
- LIQUID COOLING**  
ONE-DIMENSIONAL HEAT FLOW EQUATION FOR LIQUID  
NITROGEN END-COOLED RUBY LASER ROD A66-38386
- X-BAND RUBY MASER DESIGN WITH LIQUID HYDROGEN  
COOLING FOR HIGH GAIN AT LOW PUMPING POWER  
A67-19131
- LIQUID FLOW**  
LASER VELOCIMETER MEASUREMENT OF POINT VELOCITIES  
IN TURBULENT LIQUID FLOW IN PIPE, USING  
STATISTICAL ANALYSIS TO VERIFY RESULTS  
AIAA PAPER 67-179 A67-18511
- LIQUID HELIUM**  
CHARACTERISTICS OF EFFICIENT SEMICONDUCTOR LASERS  
IN UV PORTION OF SPECTRUM OBTAINED AT BOTH LIQUID  
HELIUM AND NITROGEN TEMPERATURES, USING PULSED  
ELECTRON BEAM EXCITATION ON ZN S CRYSTALS  
A66-39114
- HELIUM COOLING SYSTEM FOR SOLID STATE MASER  
AMPLIFIER INSTALLATION AT COMMUNICATION SATELLITE  
GROUND STATION N67-12314
- LIQUID HYDROGEN**  
X-BAND RUBY MASER DESIGN WITH LIQUID HYDROGEN  
COOLING FOR HIGH GAIN AT LOW PUMPING POWER  
A67-19131
- LIQUID LASER**  
COUPLED WAVE FORMALISM, GIVING UNIFIED DESCRIPTION  
OF PARAMETRIC DOWN CONVERSION OF LIGHT, STIMULATED  
BRILLOUIN AND RAMAN EFFECTS, ETC, STRESSING  
EXPONENTIAL CHARACTER OF GAIN A66-26156
- RECIRCULATION OF LIQUID THROUGH CELL AND EXTERNAL  
HEAT EXCHANGER TO SOLVE PROBLEM OF REPEATED  
FLASHING IN EUROPIUM CHELATE LASERS  
A66-39108
- TRIVALENT NEODYMIUM IN SELENIUM OXYCHLORIDE,  
INORGANIC LIQUID LASER WITHOUT LIMITATIONS OF  
EUROPIUM CHELATES AND MATCHING IN THRESHOLD AND  
OUTPUT NEODYMIUM-DOPED CRYSTALS  
A66-39110
- PERFORMANCE CHARACTERISTICS OF ROOM TEMPERATURE  
LIQUID LASER, USING TRIVALENT ION NEODYMIUM-DOPED  
SELENIUM OXYCHLORIDE A66-39111
- THEORETICAL OPTICAL RESONATOR FOR LASER WITH RARE  
EARTH LIQUID SOLUTIONS AS ACTIVE COMPONENTS  
A66-39549
- DIRECT-EXCITATION LIQUID LASER MEASURED FOR  
QUANTUM EFFICIENCY FLUORESCENCE  
AD-628526 N66-24728
- LIQUID NITROGEN**  
ONE-DIMENSIONAL HEAT FLOW EQUATION FOR LIQUID  
NITROGEN END-COOLED RUBY LASER ROD  
A66-38386
- LITHIUM COMPOUND**  
PARAMETRIC OSCILLATOR THEORY APPLIED TO TUNABLE  
COHERENT OPTICAL PARAMETRIC OSCILLATION IN LITHIUM  
NIOBATE A66-26145
- OPTICAL BEAM SCATTERING OF GAS LASER FOR  
MEASUREMENT OF PHOTOELASTIC CONSTANTS AND  
APPLICATION TO LITHIUM NIOBATE A66-28692
- PARAMETRIC OSCILLATOR THRESHOLD WITH SINGLE MODE  
OPTICAL MASERS AND OBSERVATION OF AMPLIFICATION IN  
LITHIUM NIOBATE A66-32716
- LITHIUM FLUORIDE**  
SPECTROSCOPY OF LITHIUM FLUORIDE CRYSTALS  
ACTIVATED WITH URANIUM TRIOXIDE FOR LASER ACTION,  
SHOWING ANOMALOUS FLUORESCENT DECAY UNDER HIGH  
INTENSITY PUMPING A66-25997
- LI F SINGLE CRYSTAL DESTRUCTION AS FUNCTION OF  
LASER BEAM ENERGY, EXAMINING DISLOCATION PATTERN  
ARISING FROM CRACK PROPAGATION A67-10071
- KINETICS OF FORMATION AND HEALING OF DAMAGE CAUSED  
BY LASER PULSE IN LITHIUM FLUORIDE SINGLE CRYSTALS  
A67-17057
- LITHIUM HYDRIDE**  
HIGH TEMPERATURE HIGH-DENSITY PLASMA FROM SINGLE  
SOLID PARTICLE OF LITHIUM HYDRIDE SUSPENDED IN  
VACUUM, USING RUBY LASER IRRADIATION  
A66-36596
- HIGH TEMPERATURE SINGLE SOLID PARTICLE PLASMA  
GENERATION BY FOCUSED GIANT PULSE Q-SPOILED RUBY  
LASER BEAM IRRADIATION OF LI H SUSPENDED IN  
VACUUM ELECTRIC FIELDS A67-14047



## LOGIC CIRCUIT

LASERS APPLIED TO LOGIC, MEMORY, INPUT-OUTPUT AND  
DATA TRANSMISSION-LINKAGES PARTS OF COMPUTERS  
A66-42804

SEMICONDUCTOR LASERS FOR DIGITAL COMPUTER CIRCUITS  
N67-13063

## LONGITUDINAL WAVE

MULTIMODALITY OF GAS LASER IN RESONATOR WITH  
ONE DIRECTION TRAVELING WAVE PROPAGATION  
N67-11315

## LORENTZ

ACTUAL LINE SHAPE EXPECTED FROM ACCELERATING  
RADIATING ION, ERRORS DUE TO LORENTZIAN  
APPROXIMATION AND RESULTS FOR ION LASER TRANSITION  
IN RARE GAS LASERS  
A66-30181

## LORENTZ FORCE

TEMPERATURES, LORENTZIAN WIDTHS AND DRIFT  
VELOCITIES OF EXCITED NEUTRAL AND IONIC SPECIES IN  
ARGON-ION LASER, NOTING THERMAL EQUILIBRIUM  
ACHIEVEMENT  
A66-28695

## LOW FREQUENCY

AMPLITUDE OF LF OSCILLATIONS IN HE- NE LASER  
A67-16948

## LOW TEMPERATURE PHYSICS

LOW TEMPERATURE TECHNIQUES IN SATELLITE  
COMMUNICATIONS SYSTEMS, NOTING MASER, COOLED  
PARAMETRIC AMPLIFIER AND TREND TOWARD CLOSED-CYCLE  
REFRIGERATORS  
A66-26104

DEVELOPMENT OF OPTICAL QUANTUM GENERATOR FROM  
HIGHLY IONIZED LOW TEMPERATURE TO CONVERT HEAT  
ENERGY INTO ELECTRIC AND COHERENT LIGHT  
RADIATION ENERGIES FOR USE IN LASER  
JPRS-39659  
N67-18113

## LOWER ATMOSPHERE

LASER RADAR RETURNS FROM LOWER TROPOSPHERE  
COMPARED WITH VERTICAL OZONE DISTRIBUTIONS  
INDICATE INVERSE RELATIONSHIP  
A67-14676

## LUMINESCENCE

LASER-GENERATION-TYPE LUMINESCENCE CD S- CD SE  
CRYSTALS EXPOSED TO DOUBLE PHOTON EXCITATION FROM  
RUBY LASER  
A66-27647

RELATION BETWEEN NONLINEAR LUMINESCENCE  
QUENCHING AND CONCENTRATION OF LUMINESCENCE  
CENTERS IN LASER CRYSTAL  
A66-29204

RELATION BETWEEN NONLINEAR LUMINESCENCE QUENCHING  
AND CONCENTRATION OF LUMINESCENCE CENTERS IN  
LASER CRYSTAL  
A66-33053

SPECTRAL DISTRIBUTION OF RUBY LUMINESCENCE YIELD,  
NOTING ABSORPTION COEFFICIENT AND EXCITATION  
BAND  
A66-33509

ORGANIC LASER SYSTEMS INCLUDING LUMINESCENCE FOR  
ACHIEVING LASER ACTION, FLUORESCENT AND  
PHOSPHORESCENT SYSTEMS AND CHEMISTRY AND  
SPECTROSCOPIC PROPERTIES OF RARE EARTH CHELATES  
A66-36970

PHOTOCONDUCTIVE AND LUMINESCENT BEHAVIOR OF  
UNDOPED CADMIUM SULFIDE SINGLE CRYSTALS AT ROOM  
TEMPERATURE UNDER LASER EXCITATION  
A66-39165

STIMULATED EMISSION, ABSORPTION SPECTRA AND  
LUMINESCENCE OF NEODYMIUM-ACTIVATED YAG CRYSTALS  
IN PULSED LASER  
A66-39306

SPECTRAL DISTRIBUTION OF RUBY LUMINESCENCE YIELD,  
NOTING ABSORPTION COEFFICIENT AND EXCITATION BAND  
A66-42123

RADIATION OF GIANT PULSES OF SUPERLUMINESCENCE BY  
HIGHLY EXCITED ACTIVE MEDIUM OF ND GLASS WITH  
RAPID CUT-IN OF AMPLIFICATION  
A66-42755

SYNTHESIS, JUNCTION FABRICATION, AND LUMINESCENT  
OPERATION OF GALLIUM-ARSENIDE-PHOSPHIDE  
SEMICONDUCTORS

AFCRL-66-245  
N66-36868

RADIATION OF GIANT PULSES OF SUPERLUMINESCENCE BY  
HIGHLY EXCITED ACTIVE MEDIUM OF ND GLASS WITH  
RAPID CUT-IN OF AMPLIFICATION  
A67-10837

LUMINESCENCE IN CADMIUM SULFIDE MIXED CRYSTALS OF  
WIDELY VARYING COMPOSITION IN PRESENCE OF  
EXCITATION BY RUBY LASER EMISSION  
A67-13153

CALCIUM FLUORIDE-CERIUM FLUORIDE WITH NEODYMIUM  
ADDITIONS AS ACTIVE MEDIUM FOR LASERS, DISCUSSING  
ABSORPTION AND LUMINESCENCE SPECTRA AND INDUCED  
RADIATION  
A67-16922

JUNCTION EFFECTS IN COMPOUND SEMICONDUCTORS  
AFCRL-66-617  
N67-15074

## LUMINESCENT INTENSITY

ELECTROLUMINESCENCE, DISCUSSING SEMICONDUCTOR  
LASERS WITH VARIOUS EXCITATION SOURCES,  
LUMINESCENT EFFICIENCY, ETC  
A67-17889

## LUNAR DISK

DESCRIPTION OF RUBY LASER USED IN OPTICAL LOCATION  
OF MOON  
NASA-TT-F-8866  
N66-29428

## LUNAR LANDING

BIOMEDICAL PREPARATIONS FOR MANNED LUNAR LANDING,  
COLD ACCLIMATIZATION IN FAR NORTH, AND LASERS IN  
OPHTHALMOLOGY  
JPRS-36229  
N66-33200

## LUNAR PROBE

LUNAR FIGURE AND ORBIT PARAMETERS MEASURED BY  
OPTICAL LOCATION METHOD  
A66-35285

## M

## MACH-ZEHNDER INTERFEROMETER

THERMALLY-INDUCED OPTICAL PATH DISTORTIONS IN  
LASER ROOS MEASURED BY OBTAINING TIME RESOLVED  
INTERFEROGRAMS, USING MACH- ZEHNDER  
INTERFEROMETER AND Q-SWITCHED LASER  
A66-25994

HIGH TEMPERATURE FLOW CHARACTERISTICS IN FREE  
PISTON SHOCK TUBE MEASURED BY MEANS OF PULSED  
LIGHT OF HE- NE GAS LASER  
A66-35353

COMPRESSIBLE AND INCOMPRESSIBLE FLOWS MADE VISIBLE  
BY OPTICAL METHOD SENSITIVE TO DENSITY VARIATIONS,  
SHADOWGRAPH, SCHLIEREN SYSTEM, MACH- ZEHNDER  
INTERFEROMETER AND HOLOGRAPHIC INTERFEROMETRY WITH  
LASERS  
A66-43196

## MACHINE TOOL

PULSED LASERS AS MACHINE TOOLS FOR MATERIAL  
REMOVAL, NOTING TESTS ON TITANIUM, ALUMINUM OXIDE,  
STEEL, ETC  
A67-15308

## MAGNETIC CONTROL

FARADAY ROTATION OBTAINED WITH PULSED HIGH-FIELD  
MAGNETS FOR CONTROLLING LASER CAVITIES  
A66-35380

## MAGNETIC DIPOLE

LASER CHARACTERISTICS OF NARROW BAND TYPE I SOLAR  
RADIO BURST AND MAGNETIC DIPOLE TRANSITIONS IN  
SPLIT ZEEMAN SUBLEVELS OF HYDROGEN ATOMS OF  
SOLAR CORONA IN GROUND LEVEL  
A67-11652

## MAGNETIC DOMAIN

MAGNETIC DOMAIN PATTERNS IN THIN FERROMAGNETIC  
FILMS USING 10 MILLIWATT HELIUM-NEON LASER  
N66-30158

## MAGNETIC EFFECT

IONIZED NOBLE GAS LASERS, CONSIDERING PROBLEMS AT  
HIGHER POWERS, ESPECIALLY THOSE OF INVERSION  
MECHANISM AND MAGNETIC FIELD EFFECTS  
A66-33767

GAS LASER BEHAVIOR IN MAGNETIC FIELD, ANALYZING  
DATA ON MAGNETIC EFFECT, ZEEMAN EFFECT AND  
MICROWAVE PUMPING  
A67-18168

## MAGNETIC FIELD

PHOTOLUMINESCENCE AND STIMULATED EMISSION OF GALLIUM ARSENIDE AND INDIUM ANTIMONIDE OBTAINED BY OPTICAL PUMPING, NOTING EFFECT OF APPLIED MAGNETIC FIELD ON LASER AND DIODE EMISSIONS

A66-26182

SPONTANEOUS AND COHERENT EMISSION FROM LEAD SULFIDE, TELLURIDE AND SELENIDE DIODE LASERS IN ORIENTED MAGNETIC FIELD, DETERMINING BAND EDGE PARAMETERS FROM SPIN-SPLIT ZERO ORDER LANDAU LEVEL TRANSITIONS

A66-26185

ORGANIC GAS MAGNETICALLY TUNED LASER SPECTROSCOPY, DISCUSSING RESOLUTION, ABSORPTION SPECTRA AND VIBRATIONAL DEACTIVATION

A66-26197

MULTIPLE QUANTUM EQUATIONS FOR MODE AMPLITUDE AND FREQUENCY DETERMINATION FOR MAGNETIC FIELD-TUNED GAS OPTICAL MASER

A66-26200

HYDROGEN ATOM BEAM CHARACTERISTICS, DISCUSSING SIGNAL POWER, GENERATING FREQUENCY, RADIATION SIGNAL DAMPING AND HYDROGEN ATOM RELAXATION TIME

A66-28289

TRANSVERSE AND AXIAL MAGNETIC FIELD EFFECTS ON GAS LASERS, DERIVING EXPRESSION FOR ATOMIC AND MACROSCOPIC POLARIZATION, DETERMINING OSCILLATION MODE CHARACTERISTICS, FREQUENCY RESPONSES, ETC

A66-29813

GAS LASER EMISSION IN WEAK LONGITUDINAL MAGNETIC FIELD ASSUMING ZEEMAN SPLITTING IS MUCH SMALLER THAN DOPPLER LINEWIDTH

A66-32319

STRONG AXIAL MAGNETIC FIELD EFFECT ON CONSTANT CURRENT DISCHARGE IN CONTINUOUS-DUTY ION LASER, NOTING PLASMA DIFFUSION, CHARGED PARTICLE DENSITY AND LASER OUTPUT DECREASE

A66-33117

DEGRADATION OF CONTINUOUS ARGON LASER PERFORMANCE WHEN POSITIONED IN AXIAL MAGNETIC FIELD, NOTING ROLE OF QUENCHING, RADIATION TRAPPING AND EXCITATION MECHANISMS

A66-37779

QUENCHING AND HYSTERESIS EFFECTS BETWEEN ZEEMAN OSCILLATIONS ON SINGLE AXIAL MODE OBSERVED IN NEAR-ZERO MAGNETIC FIELDS FOR SHORT PLANAR LASER

A66-39116

CURRENT MEASURING DEVICE FOR EHV TRANSMISSION LINE, OBTAINING INSTANTANEOUS MAGNETIC FIELD BY GAUGING FARADAY ROTATION ANGLE OF LASER BEAM IN FLINT GLASS ROD

A66-42556

MAGNETIC DIPOLE MOMENT IN SPARK PRODUCED BY FOCUSING LASER RADIATION

A66-43055

CONTROLLED THERMONUCLEAR STUDIES - CAULKED STUFFED CUSP MINIMUM-B MACHINE, SCYLLA OPERATION AND MEASUREMENTS, RUBY LASER TESTING, PLASMA GUNS, AND ELECTRIC AND MAGNETIC FIELD MEASUREMENTS

N66-25226

MANUFACTURING RESEARCH IN SUPPORT OF SATURN V - TIME-TEMPERATURE AS COMMON DENOMINATOR IN WELDING, PINK RUBY LASER FOR DRILLING AND WELDING, AND MAGNETIC-FIELD TOOLS

N66-36420

SUPERPOWER LASERS AND MAGNETIC FIELD TOOLS FOR USE IN DRILLING AND WELDING

N66-36423

HIGH CURRENT DISCHARGE EFFECT ON MAGNETICALLY CONFINED ARGON LASER

A67-10012

MASER OSCILLATION INTENSITY AND FREQUENCY DEPENDENCE ON CONSTANT ELECTRIC AND MAGNETIC FIELDS ACTING ON MOLECULAR BEAM IN FRONT OF RESONATOR

A67-10396

Q-SPOILING OF RUBY LASER BY OPTICAL PUMPING IN INTENSE INHOMOGENEOUS MAGNETIC FIELD WITH REDUCED GAIN

A67-12505

DOUBLE RESONANCE EFFECTS EXTENDED TO CASE OF STIMULATED EMISSION IN EXCITED STATES OF NEON, USING GAS LASER IN TRANSVERSE DC MAGNETIC FIELD

A67-16645

POLARIZATION CHARACTERISTICS OF IONIZED ARGON LASER IN MAGNETIC FIELD

A67-18542

## MAGNETIC FIELD INTENSITY

DEPENDENCE OF ZEEMAN BEAT FREQUENCY ON INTERFEROMETER TUNING IN SINGLE-MODE HE-NE LASER WITH VARIOUS GAS PRESSURES AND MAGNETIC FIELD STRENGTHS

A66-26201

EFFECT OF LONGITUDINAL MAGNETIC FIELD ON OUTPUT POWER OF GAS LASER OPERATING IN IR SPECTRUM, NOTING GAS-MIXTURE PRESSURE IN DISCHARGE TUBE ROLE

A66-27156

DEPENDENCE OF EMISSION INTENSITY OF GAS LASER ON LONGITUDINAL AND TRANSVERSE MAGNETIC FIELDS, USING SIMPLIFIED MODEL

A66-41092

EFFECT OF LONGITUDINAL MAGNETIC FIELD ON OUTPUT POWER OF GAS LASER OPERATING IN IR SPECTRUM, NOTING GAS-MIXTURE PRESSURE IN DISCHARGE TUBE

A66-42977

AXIAL MAGNETIC FIELD EFFECT ON NE-HE LASER POWER OUTPUT OPERATING IN REGIME OF SIMULTANEOUS GENERATION OF 3.39 AND 0.6328 MICRON LINES

A67-19601

## MAGNETIC MATERIAL

RESONATOR MADE OF MAGNETIC MATERIALS FOR TUNING MOLECULAR GENERATOR BY ZEEMAN MODULATION

A66-39851

## MAGNETIC MIRROR

RESEARCH ON PLASMA STABILITY, BEAM INTERACTIONS, AND ELECTRIC BREAKDOWN OF GAS BY LASER

N67-14307

## MAGNETIC RELAXATION

MAGNETIC FIELD GRADIENT RELAXATION MECHANISM BY RANDOM EXCITATION OF TRANSITIONS IN F EQUALS 1 LEVEL OF GROUND STATE OF HYDROGEN ATOMS IN MASER

A67-16635

## MAGNETIC RESONANCE

SINGLE CAVITY MICROWAVE LASER AMPLIFIER ANALYSIS, DETERMINING GAIN, BANDWIDTH, NOISE, CAVITY Q-FACTOR EFFECT AND WIDTH OF MAGNETIC RESONANCE LINE

A66-37583

## MAGNETIC SWITCHING

HIGH POWER LASER RESEARCH - LASER MATERIAL EVALUATION, STIMULATED OUTPUT AND Q-SWITCHING, SELF-FOCUSING IN LIQUIDS, AND FLASH LAMP SPECTROSCOPY

N67-12645

MAGNETIC LOW TEMPERATURE Q-SWITCHING OF RUBY LASER

N67-12648

## MAGNETIC TRAP

SUPERCONDUCTOR SOLENOID APPLICATION TO LASER DEVICES AND DEVELOPMENT OF MAGNETIC PLASMA TRAPS FOR RESEARCH IN CONTROLLED THERMONUCLEAR REACTIONS

A66-41743

## MAGNETIZATION

MAGNETIZATION INDUCED BY CIRCULARLY POLARIZED LASER LIGHT INCIDENT ON NONABSORBING MATERIAL, IN ABSENCE OF EXTERNAL MAGNETIC FIELD, IN DOPED CALCIUM FLUORIDE PROPORTIONAL TO LIGHT INTENSITY AND VERDET CONSTANT

A66-26142

MAGNETO-OPTIC OBSERVATIONS WITH GAS LASER, HIGH SPEED MAGNETIZATION REVERSAL EQUIPMENT, INFRARED ABSORPTION SPECTRA, AND CONTINUOUS SOURCE WAVEGUIDE ANTENNA SYNTHESIS

N66-30157

## MAGNETO-OPTIC

VALENCE BAND SPIN-ORBIT SPLITTING IN HIGHLY DEGENERATE SEMICONDUCTORS DETERMINED FROM SPLITTING OF PEAK LASER DIODE EMISSION IN HIGH MAGNETIC FIELDS

A66-36036

MAGNETO-OPTIC OBSERVATIONS WITH GAS LASER, HIGH SPEED MAGNETIZATION REVERSAL EQUIPMENT, INFRARED

- ABSORPTION SPECTRA, AND CONTINUOUS SOURCE  
WAVEGUIDE ANTENNA SYNTHESIS  
NAVWEPS-8847 N66-30157
- MAGNETIC DOMAIN PATTERNS IN THIN FERROMAGNETIC  
FILMS USING 10 MILLIWATT HELIUM-NEON LASER  
N66-30158
- HIGH MAGNETIC FIELD EFFECT ON INTERBAND  
SEMICONDUCTOR LASER, PARTICULARLY ELECTROMAGNETIC  
MODES AND COUPLING AND THRESHOLD CURRENT  
CONDITIONS A67-16673
- MAGNETOPLASMA**  
SUPERCONDUCTOR SOLENOID APPLICATION TO LASER  
DEVICES AND DEVELOPMENT OF MAGNETIC PLASMA TRAPS  
FOR RESEARCH IN CONTROLLED THERMONUCLEAR REACTIONS  
A66-41743
- MAGNETICALLY COMPRESSED PLASMA AS HIGH INTENSITY  
SOURCE OF NEAR UV AND VISIBLE RADIATION  
EXPERIMENTALLY STUDIED IN DYNAMIC PINCH  
A67-11880
- MAMMAL**  
RETINAL LESIONS PRODUCED BY RUBY LASER IN RABBITS  
AND HUMANS A66-82224
- MANGANESE**  
LASER ACTION ON SEVERAL HYPERFINE TRANSITIONS IN  
MN I A66-34000
- MANNED SPACECRAFT**  
BIOMEDICAL PREPARATIONS FOR MANNED LUNAR LANDING,  
COLD ACCLIMATIZATION IN FAR NORTH, AND LASERS IN  
OPHTHALMOLOGY  
JPRS-36229 N66-33200
- MANUFACTURING**  
MANUFACTURING RESEARCH IN SUPPORT OF SATURN V -  
TIME-TEMPERATURE AS COMMON DENOMINATOR IN  
WELDING, PINK RUBY LASER FOR DRILLING AND  
WELDING, AND MAGNETIC-FIELD TOOLS  
NASA-TM-X-53505 N66-36420
- MANY-PARTICLE THEORY**  
QUANTUM THEORY OF Q-SPOILED LASER, NOTING  
STATISTICS OF NUMBER OF PHOTONS IN MODE BEAR  
QUALITATIVE RESEMBLANCE TO POISSON STATISTICS  
A66-41373
- MARS SPACECRAFT**  
SPACE COMMUNICATION REQUIREMENTS USING LASERS AND  
MICROWAVES IN MANNED MARS FLIGHTS  
AIAA PAPER 65-324 A66-33794
- MASER OUTPUT**  
BEAM MASER EXCITATION PARAMETER CALCULATIONS  
INCLUDING COLLISION IN BEAM EFFECTS AND COMPARISON  
WITH MOLECULAR FORMALDEHYDE A66-26054
- EMISSION SPECTRUM OF RUBY MASER CALCULATED, USING  
DYNAMICS OF TWO-LEVEL SYSTEMS A66-29988
- STIMULATED EMISSION PROCESSES INTERPRETING OH  
MICROWAVE EMISSION FROM POINTS IN SKY, USING  
ANISOTROPIC UV RADIATION WHICH LEADS TO  
MOLECULE ALIGNMENT AND POPULATION INVERSION  
A66-37343
- MASER AMPLIFIER BASED ON UV CONTINUUM PUMPING  
FROM NEARBY STARS, EXPLAINING 18-CM OH EMISSION  
FROM ANOMALOUS H-2 REGIONS A66-43042
- OSCILLATION FREQUENCY OF MASER OSCILLATOR  
CALCULATED USING PERTURBATION THEORY, NOTING  
TRAVELING WAVE EFFECT A67-10395
- TRAVELING WAVE MASER CONSISTING OF PARAMAGNETIC  
CRYSTAL /CHROMIUM DOPED RUTILE/, SLOW WAVE CIRCUIT  
AND FERRITE ISOLATOR, DISCUSSING PERFORMANCE,  
STAGGER TUNING, ETC A67-11787
- MASER RESONATOR**  
TUNING OF AMMONIA BEAM MASER RESONATOR BASED ON  
FREQUENCY SHIFT METHOD, NOTING HYSTERESIS  
APPEARANCE AND ELIMINATION A66-31696
- RESONATOR MADE OF MAGNETIC MATERIALS FOR TUNING
- MOLECULAR GENERATOR BY ZEEMAN MODULATION  
A66-39851
- SOLID STATE MASER OSCILLATOR OPERATING IN ZERO  
FIELD CONFIGURATION, USING FERRIC ION SUBSTITUTED  
AS IMPURITY IN ALUMINUM NITRATE HOST CRYSTAL  
A66-42551
- VERY FINE-BEAMED MASER OSCILLATION PRODUCED IN  
ATOMIC HYDROGEN BY HF DISCHARGE OBSERVED BY  
DOUBLE FOCUSING TECHNIQUE A66-42993
- RESONANT FREQUENCY EQUATIONS FOR OPTICAL MASER  
PHOTON RATE GYROSCOPE DESIGN  
NASA-CR-59820 N66-33372
- CHROMIUM-DOPED RUTILE SUITABILITY AS ACTIVE  
MATERIAL IN SOLID STATE MASER RESONATOR  
A67-10246
- MASER OSCILLATION INTENSITY AND FREQUENCY  
DEPENDENCE ON CONSTANT ELECTRIC AND MAGNETIC  
FIELDS ACTING ON MOLECULAR BEAM IN FRONT OF  
RESONATOR A67-10396
- AMPLITUDE AND FREQUENCY CHARACTERISTICS OF  
HYDROGEN-ATOM BEAM MASER A67-11574
- TWO-FREQUENCY VOLUME RESONATOR WITH INDEPENDENT  
TUNING WITHIN WIDE FREQUENCY BAND  
A67-11911
- OSCILLATION AMPLITUDE MODULATION IN AMMONIA BEAM  
MASER OSCILLATOR WITH SINGLE CAVITY FOLLOWED BY  
TWO CAVITIES IN CASCADE A67-16636
- OSCILLATION OF MASER WITH SINUSOIDAL DISTRIBUTION  
OF RESONATOR FIELD ALONG AXIS OF MOLECULAR MOTION  
A67-17234
- INTRINSIC NOISE TEMPERATURE MEASUREMENT IN  
REFLECTION TYPE CAVITY MASER A67-17892
- MASS SPECTROMETER**  
LASER MATERIALS, GAS CHROMATOGRAPH-MASS  
SPECTROMETER COMBINATION, AND RESEARCH IN  
CHEMISTRY, METALLURGY, CERAMICS, OPTICAL PHYSICS,  
RADIO, AND SOLID STATE PHYSICS  
PB-169690 N66-28514
- INVESTIGATIONS OF HIGH POWER LASER RADIATION  
INTERACTION WITH SURFACES USING QUADRUPOLE AND  
TIME-OF-FLIGHT MASS SPECTROMETERS  
AD-636680 N66-38247
- MASS SPECTROMETRY**  
LASER VAPORIZATION AND IONIZATION OF SOLID  
MATERIALS TO OBTAIN IONS FOR TIME-OF-FLIGHT MASS  
SPECTROMETER A66-39385
- MASS SPECTROSCOPY**  
Q-SWITCH PULSED RUBY LASER IRRADIATION-INDUCED  
CHEMICAL DISSOCIATION AND IONIZATION IN RESIDUAL  
GASES A66-42076
- MATERIAL TESTING**  
LASER BEAM EFFECT ON HYDRODYNAMIC BEARINGS,  
DISCUSSING MICROCRACKS AND CRITICAL ENERGY,  
EXPLAINING BREAKDOWNS A66-41409
- HIGH POWER LASER RESEARCH - LASER MATERIAL  
EVALUATION, STIMULATED OUTPUT AND Q-SWITCHING,  
SELF-FOCUSING IN LIQUIDS, AND FLASH LAMP  
SPECTROSCOPY  
NRL-6444 N67-12645
- EQUIPMENT ASSEMBLY FOR LASER MATERIALS EVALUATION  
PROGRAM N67-12647
- MATHEMATICAL MODEL**  
MATHEMATICAL MODEL OF GA AS INJECTION LASER  
APPLIED IN DETERMINING MAXIMUM OBTAINABLE POWER  
OUTPUT, USING RATE EQUATIONS OF ELECTRON AND  
PHOTON DENSITIES AND THERMAL RESISTANCE FOR  
OPTIMUM VALUE A66-26572
- Q-SWITCHED RUBY LASER CONFIGURATION WITH FEEDBACK  
CONTROL, NOTING FREQUENCY AND INSTABILITY  
CORRELATION WITH THEORETICAL RESULTS OBTAINED

FROM MATHEMATICAL MODEL A67-16676

STATISTICAL MODELS USED IN COMPUTER PROGRAM TO  
SIMULATE ATMOSPHERE EFFECT ON LASER RECEIVER  
N67-15746

**MATHEMATICS**  
MATHEMATICAL FORMULAS TO DETERMINE RADIATION  
LOSS MEASUREMENT IN RUBY LASER  
TG-230-T468 N66-34235

**MATRIX ANALYSIS**  
EIGENVALUES AND EIGENFUNCTIONS OF SPIN  
HAMILTONIAN AND MATRIX ELEMENTS OF SPIN OPERATOR  
OF RUBY A66-37584

**MAXWELL EQUATION**  
SECOND HARMONIC GENERATION OF LIGHT ANALYZED,  
STRESSING SATURATION EFFECTS OCCURRING AT HIGH  
LASER POWER, SOLVING NONLINEAR MAXWELL EQUATIONS  
A66-26144

NONLINEAR OPTICS, CONSIDERING MAXWELL EQUATION  
AND NONLINEAR MATERIAL RESPONSE A66-26964

**MEASURING APPARATUS**  
MEASURING DEVICE FOR PULSED LASER OUTPUT POWER  
USING BOLTOMETER, AMPLIFIER AND OSCILLOSCOPE  
A66-29701

LASER DOPPLER VELOCIMETER FOR GAS AND LIQUID FLOW  
VELOCITY MEASUREMENT A66-42557

PHOTOELECTRONIC COMPONENTS AND ELECTRONIC  
MEASUREMENT TECHNIQUES IN RECEPTION AND  
DEMODULATION OF HF MODULATED LASER BEAMS  
A67-10300

LASER EXTENSOMETER MEASURING SMALL DIMENSIONAL  
CHANGES OF SPECIMEN IN TENSILE TESTING FURNACE AT  
HIGH TEMPERATURES A67-18778

**MECHANICAL RESONANCE**  
LASER MIRROR TRANSDUCER DECOUPLING FROM MECHANICAL  
RESONANCES OF LASER CAVITY A66-35813

**MELTING**  
YTTRIUM-ALUMINUM GARNET CRYSTAL GROWTH FROM MOLTEN  
FLUX FOR LASER APPLICATION N66-34570

**MELTING POINT**  
MIRROR DAMAGE ALLEVIATION IN GIANT PULSE  
SEMICONDUCTOR LASER OPERATION, DISCUSSING USE OF  
HIGH MELTING POINT MIRRORS COOLING AND OBLIQUE  
INCIDENCE A66-38245

**MEMORY**  
LASERS APPLIED TO LOGIC, MEMORY, INPUT-OUTPUT AND  
DATA TRANSMISSION-LINKAGES PARTS OF COMPUTERS  
A66-42804

**MERCURY ARC**  
C W HE- NE LASER COMPARED WITH MERCURY ARC  
SOURCE, OBTAINING RAMAN SPECTRA OF CARBON  
TETRACHLORIDE BY THREE METHODS OF EXCITATION  
A67-13912

**MERCURY LIGHT**  
QUALITATIVE RESULTS ON TRANSPORT MECHANISMS  
AROUND DROPPING MERCURY ELECTRODE, USING LONG PATH  
LASER INTERFEROMETRY A66-33924

RUBY LASER PUMPING SYSTEM AND LOW COST MERCURY  
FLASH TUBE WITH HIGH REPETITION RATES USED FOR  
MICROMACHINING PROCESS A66-40336

**MERCURY TELLURIDE**  
SEMICONDUCTOR LASERS AND FAST IR DETECTORS,  
DISCUSSING IN AS, IN SB AND THREE TYPES OF  
MERCURY CADMIUM TELLURIDE DETECTORS  
A67-16668

**METAL CRYSTAL**  
EFFECT OF ANOMALOUS DISPERSION ON STIMULATED  
EMISSION SPECTRUM OF DOPED CADMIUM FLUORIDE  
CRYSTALS A66-32317

**METAL FILM**  
VAPORIZATION OF THIN METALLIC FILMS WITH FOCUSED  
LASER BEAM, COMPARING THEORETICAL AND EXPERIMENTAL  
RESULTS PREPARED BY USING PULSED HIGH PRESSURE  
HELIUM-NEON LASER A67-15478

**METAL FOIL**  
LASER BEAM ENERGY PROFILE DETERMINED BY MULTIPLE-  
LAYER ALUMINUM FOIL TECHNIQUE A66-31217

LASER INDUCED SPONTANEOUS ELECTRON EMISSION FROM  
REAR SIDE OF METAL FOILS, NOTING ELECTRON ENERGY  
VS LASER ENERGY PULSE MAGNITUDE, ETC A66-31536

TEMPERATURE MEASUREMENTS OF LASER SPARKS FROM  
RELATIVE INTENSITY OF X-RAY FLUX TRANSMITTED  
THROUGH BERYLLIUM FOILS OF DIFFERENT THICKNESS  
A66-40421

TIME RESOLVED AND TIME INTEGRATED MEASUREMENTS OF  
PLASMA PRODUCED BY Q-SWITCHED LASER BEAM  
FOCUSED ON SURFACE OF METALLIC SOLID  
NOLTR-66-96 N67-17906

**METAL OXIDE**  
C W LASER ACTION IN HOLMIUM-DOPED ERBIUM TRIOXIDE  
WITH DOMINANT PUMPING BY ENERGY TRANSFER BETWEEN  
IONS A66-42555

**METAL SURFACE**  
SURFACE TEMPERATURE DETERMINATION PROCEDURE FOR  
LASER HEATED METALS BASED ON HEAT CONDUCTION  
EQUATIONS AND ION EMISSION FROM SURFACE A66-29035

ENERGIES OF IONS GENERATED FROM METAL SURFACE  
IRRADIATED BY SINGLE GIANT PULSE LASER A66-38412

**METAL VAPOR**  
ALUMINA HIGH TEMPERATURE GAS DISCHARGE TUBE FOR  
INVESTIGATION OF PULSED METAL VAPOR LASER  
OSCILLATIONS A66-35810

LASER RADIATION EFFECT ON METALS, NOTING  
DISINTEGRATION MECHANISM, INDENTATION FORMATION  
AND VAPOR FORMATION A66-39763

MERCURY, CESIUM AND RUBIDIUM VAPORS IONIZATION IN  
INTENSE RADIATION FLUX BY Q-SWITCHED RUBY LASER  
A66-41156

RUBY LASER USED IN VAPOR DEPOSITION OF THIN METAL  
FILMS  
UD-2037-E-1 N66-32219

**METAL WORKING**  
LASER MACHINING, DISCUSSING HOLE DRILLING,  
MICROWELDING METAL REMOVAL AND APPLICATION TO HARD  
BRITTLE MATERIALS  
ASME PAPER 66-MD-28 A66-38484

LASER APPLICATION AS MEASURING EQUIPMENT IN METAL  
WORKING, DISCUSSING SURFACE-GRAZING  
INTERFEROMETER, FEEDBACK LASER DEVICE AND LENGTH  
MEASURING LASER  
ASME PAPER 66-MD-43 A66-38491

MICROSCOPIC HOLE DRILLING INTO METALS BY LASER  
BEAMS, NOTING ENERGY AND POWER CORRELATION WITH  
HOLE MAGNITUDE A67-19090

**METALLOSILOXANE POLYMER**  
AEROSPACE TECHNOLOGY RESEARCH IN U.S.S.R. -  
LASER ACTION BY SUPERCOOLED PLASMA, LITHIUM  
CRYSTAL GROWTH, METALLOSILOXANE POLYMER SYNTHESIS  
AND SPACE TECHNOLOGY CINEMATOGRAPHY N66-32699

**METALLURGY**  
LASER MATERIALS, GAS CHROMATOGRAPH-MASS  
SPECTROMETER COMBINATION, AND RESEARCH IN  
CHEMISTRY, METALLURGY, CERAMICS, OPTICAL PHYSICS,  
RADIO, AND SOLID STATE PHYSICS  
PB-169690 N66-28514

**METASTABLE ATOM**  
HELIUM-NEON LASER AFTERGLOW AND METASTABLE HELIUM

- ATOMS UNDER LONG PULSE EXCITATION A66-27335
- DEGREE OF EXCITATION OF METASTABLE STATE DETERMINED, USING LUMINESCENCE SATURATION PHENOMENON, CALCULATING POPULATION OF WORKING LEVEL OF LASER SUBSTANCE A66-30846
- MAGNITUDE OF HANLE EFFECT OF NEON ATOMS EMITTED BY LASER DEPENDENCE ON EXCITATION DISCHARGE INTENSITY EXPLAINED BY MULTIPLE COHERENT DIFFUSION AT METASTABLE LEVEL A66-37409
- DETECTING CONCENTRATION OF NITRIC OXIDE IN METASTABLE STATE IN UPPER ATMOSPHERE, USING GIANT-PULSE RAMAN LASER SOURCES A66-43022
- OPTICAL AND ELECTRON INTERACTIONS WITH METASTABLES - AFTERGLOW PLASMA IONIZATION PROCESS REPT.-24 N66-26512
- SPLITTING OF METASTABLE LEVEL OF THREE-LEVEL RUBY LASER TG-230-T467 N66-34267
- METEOR
- PUMPING MEDIUM POWER LASERS USING ARTIFICIAL METEORS TO PRODUCE INTENSE GAS GLOW IN COMPRESSION WAVE A67-17757
- METEOROLOGICAL INSTRUMENT
- HIGH POWERED Q-SWITCHED RUBY LASER / LIDAR/ FOR METEOROLOGICAL APPLICATION, NOTING SYSTEM EQUATIONS, DESIGN, OPERATION, ETC A66-26548
- READOUT TECHNIQUE FOR LASER FOG DISDRMETER A66-33346
- LASER SYSTEM FOR METEOROLOGICAL DATA USING OSCILLOSCOPE TO DISPLAY RETURN SIGNAL, TRANSLATED AS CONCENTRATIONS OF MATTER OR AEROSOLS A66-43044
- THERMALLY TUNED RUBY LASER RADAR FOR DETERMINING VERTICAL PROFILE OF ATMOSPHERIC WATER VAPOR TR-66-9 N66-35539
- METEOROLOGICAL PROBE
- ATMOSPHERIC EXPLORATION WITH LIDAR, NOTING HIGH RESOLUTION AND SENSITIVITY A66-28600
- LASER APPLICATION TO METEOROLOGY, DISCUSSING RAYLEIGH, AEROSOL AND RAMAN SCATTERING, SYSTEM CONFIGURATION AND MEASUREMENT PROBLEMS A67-19091
- METEOROLOGICAL SATELLITE
- CIRRUS CLOUD COVER OBSERVATION CAPABILITY AND PERFORMANCE SPECIFICATIONS FOR METEOROLOGICAL SATELLITE LIDAR NASA-CR-76087 N66-29977
- METEOROLOGY
- LASER SPECIFICATIONS AND PHOTOELECTRIC SEMICONDUCTOR - METEOROLOGICAL COMPUTER FOR AIR TRANSPORT FTD-TT-65-1953/1&4 N66-29797
- METEOROLOGICAL VARIABLE SENSING BY LASER PROBES NASA-CR-77909 N66-36261
- SMALL LASER RADAR APPLIED TO METEOROLOGICAL STUDIES PMR-TM-66-6 N67-12294
- METHANE
- NONLINEAR LIGHT SCATTERING IN PRESSURIZED METHANE, NOTING DISPLACEMENT OF SPECTRAL LINE FROM LASER FREQUENCY A66-26148
- STIMULATED RAMAN EFFECT IN LIQUID STANNIC CHLORIDE AND METHANE GAS USING MEDIUM POWER RUBY LASER N66-35532
- STIMULATED BRILLOUIN EFFECT IN HIGH PRESSURE GASEOUS NITROGEN, METHANE, AND CARBON DIOXIDE USING GIANT PULSE LASER N66-35533
- METHYL
- CHEMICAL PUMPED UV LASER ACTION THROUGH THERMAL DECOMPOSITION OF DIMETHYL PEROXIDE A66-28836
- GAS LASER OUTPUT AND THRESHOLD IN POPULATION INVERSION FROM PHOTODISSOCIATION OF METHYL IODIDE AND FLUOROiodo METHYLIDYNE A66-35368
- METHYLENE BLUE
- FOCUSED LASER COHERENT RADIATION-INDUCED DEGRADATION OF SOLID METHYLENE AND GAS CHROMATOGRAPHIC ANALYSIS OF REACTION PRODUCTS A66-31870
- MICHELSON INTERFEROMETER
- FLUCTUATIONS IN MEAN REFRACTIVE INDEX OVER LONG PATH THROUGH TURBULENT ATMOSPHERE EXAMINED, USING MICHELSON INTERFEROMETER WITH HE- NE LASER SOURCE A66-32618
- MICHELSON INTERFEROMETER USED TO STUDY MODES OF RED HE- NE LASER A66-33316
- DOPPLER SHIFT AND HIGH VELOCITY MIRROR TRANSLATION EFFECTS ON MUTUAL OPTICAL COHERENCE FUNCTION OF GAS LASER MICHELSON INTERFEROMETERS A66-35387
- SCATTERING MATRIX ANALYSIS OF SINGLE FREQUENCY MICHELSON TYPE HE- NE GAS LASER, INCLUDING FREQUENCY AND AMPLITUDE STABILITY ANALYSIS OF OSCILLATION SPECTRUM A66-42566
- OPTICAL PATHS AND VARIABLE-CONTRAST INTERFERENCE AT MICHELSON INTERFEROMETER WHICH ADDS TWO GROUPS OF TWO LASER COHERENT WAVES A67-17636
- MICROMETEOROID
- HYPERVELOCITY IMPACT TESTS ON ALUMINUM TARGET PLATES TO EVALUATE MICROMETEOROID IMPACT SENSORS - LASER SIMULATION STUDY NASA-CR-76102 N66-30173
- MICROMINIATURIZED ELECTRONIC EQUIPMENT
- LOW NOISE AMPLIFIERS, LASER RADAR OPTICS, GAS LASERS AND HOLOGRAPHY, AND MICROMINIATURIZED SOLID STATE DEVICES FOR RADIO ELECTRONICS N67-16009
- MICROSTRUCTURE
- MASERS AS EXCITATION MEANS FOR SPECTROGRAPHIC EXAMINATION OF METAL MICROSTRUCTURE AD-632240 N66-29847
- MICROWAVE APPARATUS
- RADIO ELECTRONICS, DISCUSSING QUANTUM ELECTRONICS, LASERS, MICROWAVE DEVICES AND TECHNOLOGY, PLASMA PHYSICS, ETC A67-18072
- THEORY AND EXPERIMENTS IN MICROWAVE PROPAGATION AND AMPLIFICATION USING SOLID STATE DEVICES, AND CALCULATIONS OF ELECTRONIC DEFLECTION OF LASER BEAMS NASA-CR-80727 N67-13665
- MICROWAVE ATTENUATION
- MICROWAVE MODULATION OF HELIUM-NEON LASER INTENSITY STUDIED AS FUNCTION OF TEMPERATURE AND ELECTRON DENSITY A67-10260
- MICROWAVE COUPLING
- MICROWAVE MIXING IN PARAMAGNETIC CRYSTAL USING TRAVELING WAVE MASER WITH RUBY AS MIXER ELEMENT, NOTING FREQUENCY CONVERSION A67-10003
- MICROWAVE FREQUENCY
- LOW NOISE PHOTODIODES WITH AVALANCHE MULTIPLICATION FOR HIGH SENSITIVITY, NOTING CAPABILITY FOR LOW INTENSITY WIDEBAND SIGNAL DETECTION, PERFORMANCE IN IR REGION, ETC A66-31934
- OPTICAL HETERODYNE RECEIVER ANTENNA PROPERTIES, NOTING EFFECTIVE APERTURE OF CAPTURE CROSS SECTION VS DIRECTIONAL TOLERANCE AND DETECTION OF DOPPLER SHIFTS IN LIQUID SCATTERED COHERENT LIGHT A66-42809

- MICROWAVE RESEARCH ON ELECTROACOUSTIC AMPLIFIERS, OPTICAL MASERS, STIMULATED RAMAN EFFECT, ACOUSTIC WAVE OPTICS, SEMICONDUCTOR OSCILLATION, NONUNIFORM PLASMAS, AND FERROMAGNETIC METALS  
ML-1464 N67-16325
- ACOUSTIC WAVE AMPLIFICATION, OPTICAL MASER, TUNABLE LASER, ACOUSTIC WAVE OPTICS, NONUNIFORM PLASMA THEORY, SEMICONDUCTOR OSCILLATION, AND FERROMAGNETIC METAL STUDIES IN MICROWAVE PROGRAM  
ML-1436 N67-16339
- MICROWAVE INTERFEROMETER**  
LASER APPLICATION AS MEASURING EQUIPMENT IN METAL WORKING, DISCUSSING SURFACE-GRAZING INTERFEROMETER, FEEDBACK LASER DEVICE AND LENGTH MEASURING LASER  
ASME PAPER 66-MD-43 A66-38491
- SUMMARY REPORTS ON RESEARCH IN PLASMA SOURCES, IONIZATION FRONTS, COMPRESSIONAL WAVES, GIANT ALFVEN WAVES, MICROWAVE INTERFEROMETRY, LASERS, AND MAGNETO- KERR EFFECT  
NP-15940 N66-34712
- MICROWAVE RADIATION**  
HYDROGEN ATOM BEAM CHARACTERISTICS, DISCUSSING SIGNAL POWER, GENERATING FREQUENCY, RADIATION SIGNAL DAMPING AND HYDROGEN ATOM RELAXATION TIME  
A66-28289
- FAST OVERLAP OF MICROWAVE RADIATION BY IONIZATION AUREOLE OF SPARK IN LASER BEAM  
A66-36719
- STIMULATED EMISSION PROCESSES INTERPRETING OH MICROWAVE EMISSION FROM POINTS IN SKY, USING ANISOTROPIC UV RADIATION WHICH LEADS TO MOLECULE ALIGNMENT AND POPULATION INVERSION  
A66-37343
- LASER BEAMS AND RESONATORS, DISCUSSING BEAM PROPAGATION IN FREE SPACE, GEOMETRICAL OPTICS APPLICATION AND RESONATOR MODES IN VIEW OF APERTURE DIFFRACTION EFFECTS  
A66-42806
- MICROWAVE RESONANCE**  
DIRECT CURRENT PUMPING AND COMBINED MICROWAVE ELECTRON-CYCLOTRON RESONANCE WITH DIRECT CURRENT PUMPING EFFECTS ON DISCHARGE BEHAVIOR AND ARGON LASER OPERATION  
REPT.-2 N66-29240
- TIME BEHAVIOR OF LIGHT EMITTED FROM MANY-ELEMENT LASER - MICROWAVE MODELS OF LASER RESONATORS  
ASR-1 N67-10283
- MICROWAVE SCATTERING**  
CALCULATIONS AND EXPERIMENTS TO DETERMINE ION WAVE INSTABILITY IN STEADY STATE DISCHARGE, LASER BREAKDOWN IN PLASMA, AND MICROWAVE SCATTERING FROM STANDING PLASMA WAVES  
N67-14628
- MICROWAVE SPECTRUM**  
VELOCITY AND LIFETIME OF MICROWAVE THERMAL PHONONS IN LIQUIDS AND SOLIDS DETERMINED BY SPECTRUM OF LIGHT SCATTERING FROM LASER ILLUMINATED SAMPLE  
A66-26166
- FERROELECTRIC MATERIALS FOR LIGAND FIELD MASER IN MILLIMETER RANGE - LIGAND FIELD NEAR GROUND STATE CROSSEOVERS MEASURED BY OPTICAL AND MICROWAVE SPECTROSCOPY  
MC-64-102-R2 N66-39741
- GAS LASER PUMPED MICROWAVE EMISSION FOR PRODUCING CONTROLLED EXCITED STATE POPULATION FOR RF SPECTROSCOPY OF NEON  
A67-16638
- MICROWAVE TRANSMISSION**  
COMMUNICATION SYSTEMS AT MICROWAVE AND OPTICAL FREQUENCIES FOR FUTURE MARS MISSIONS  
A66-33793
- SPACE COMMUNICATION REQUIREMENTS USING LASERS AND MICROWAVES IN MANNED MARS FLIGHTS  
AIAA PAPER 65-324 A66-33794
- TRAVELING WAVE MASER AS PREAMPLIFIER IN GROUND STATION FOR SATELLITE COMMUNICATION
- OPTICAL COMMUNICATION SYSTEMS, DISCUSSING AVAILABLE EQUIPMENT, TRANSMISSION CHARACTERISTIC, LACK OF LONG DISTANCE OPERATION RELIABILITY, ETC  
A66-40658
- MILLIMETER WAVE**  
DIELECTRIC MATERIAL POSITION EFFECT ON CHARACTERISTICS OF LADDER LINE SLOW WAVE STRUCTURE OF TW MASERS  
A66-27960
- ZERO MAGNETIC FIELD MILLIMETER MASER USING TRIVALENT IRON ION IN HOST CRYSTALLINE STRUCTURE OF RUTILE /TITANIUM DIOXIDE/ AS ACTIVE MATERIAL  
A66-29018
- MIRROR**  
ADJUSTMENT PROCEDURE FOR LASER WITH POLYGONAL RESONATOR, NOTING SPATIAL MIRROR ADJUSTMENT IN ADDITION TO ANGULAR ADJUSTMENT  
A66-25323
- ALIGNMENT OF LASER MIRRORS USING GAS LASER WITH HIGHLY COLLIMATED BEAM OF SMALL DIAMETER  
A66-25824
- LASER GIANT PULSE DAMAGE TO DIELECTRIC MIRROR COATINGS IMMersed IN NITROBENZENE SOLUTION  
A66-36075
- SPHERICAL COUPLER FOR FASTENING MIRRORS AND PLANE-PARALLEL PLATES AT BREWSTER ANGLE IN GAS LASER  
A66-37523
- MIRROR DAMAGE ALLEVIATION IN GIANT PULSE SEMICONDUCTOR LASER OPERATION, DISCUSSING USE OF HIGH MELTING POINT MIRRORS COOLING AND OBLIQUE INCIDENCE  
A66-38245
- PERFORMANCE CHARACTERISTICS FOR PULSE TYPE AR LASER WITH EXTERNAL INTERFERENTIAL SYSTEM OF QUASI-CONFOCAL SPHERICAL MIRRORS  
A66-41452
- GEOMETRICAL OPTICS APPROXIMATION SOLUTION TO RADIATION POWER OF GAS LASER AS FUNCTION OF MIRROR MISALIGNMENT ANGLE  
TG-230-T474 N66-34884
- ADJUSTMENT PROCEDURE FOR LASER WITH POLYGONAL RESONATOR, NOTING SPATIAL MIRROR ADJUSTMENT IN ADDITION TO ANGULAR ADJUSTMENT  
A67-10162
- OPTICAL METHODS AND EQUIPMENT USED IN CHECKING SURFACE FINISH AND VOLUME AND SURFACE INHOMOGENEITIES OF ACTIVE MEDIA AND INTERFEROMETRIC MIRRORS OF LASERS  
A67-13143
- PERFORMANCE CHARACTERISTICS FOR PULSE TYPE AR LASER WITH EXTERNAL INTERFERENTIAL SYSTEM OF QUASI-CONFOCAL SPHERICAL MIRRORS  
A67-14188
- LASER MIRROR DESIGN IN LENS FORM FOR DECOUPLING DIFFRACTION LIMITED PARALLEL BEAM, BASED ON THEOREMS CONCERNING GAUSSIAN BEAM IMAGING AND BEHAVIOR  
A67-17327
- SPHERICAL COUPLER FOR FASTENING MIRRORS AND PLANE-PARALLEL PLATES AT BREWSTER ANGLE IN GAS LASER  
A67-18394
- RESONATOR Q-MODULATION TECHNIQUE OBSERVATION OF CENTRAL DIP TUNING IN MODULATED POWER OUTPUT OF GAS LASER WITH MOVING MIRROR  
A67-18758
- EXTERNAL MIRROR FOR LASER BRIGHTNESS GAIN AND THERMAL COMPENSATING MODE CONTROL  
N67-16954
- RUBY LASER OPERATION WITH INCLINED MIRRORS  
N67-17170
- MISSILE CONTROL**  
OPTICAL SYSTEM CONSISTING OF POLARIZED LASER BEAMS FOR MONITORING MISSILE ATTITUDE DURING EARLY LAUNCH PHASE  
A67-14505

MODULATED CONTINUOUS WAVE

HIGH POWER VISIBLE CW GAS LASER BEAM GENERATION,  
MODULATION AND DEFLECTION FOR APPLICATION TO  
VISUAL DISPLAY TECHNOLOGY  
SMPTE PREPRINT 100-6 A67-13801

MODULATION TECHNIQUE

ULTRASONIC MODULATION OF LASER OSCILLATION FROM  
NEODYMIUM GLASS ROD A66-28044

ULTRASONIC CELL WHICH MODULATES INTENSITY OF  
HE- NE LASER BEAM FOR COMMUNICATION OF  
INTELLIGENCE A66-34059

SELF-MODULATION OF LASER WITH TWO-MODE RESONATOR  
A66-35372

LASER COMMUNICATIONS SYSTEM DESIGN, DESCRIBING  
RANGE EQUATION, MODULATION AND DETECTION  
TECHNIQUES, ATMOSPHERIC EFFECTS, ETC A66-37257

RESONATOR Q-MODULATION TECHNIQUE OBSERVATION OF  
CENTRAL DIP TUNING IN MODULATED POWER OUTPUT OF  
GAS LASER WITH MOVING MIRROR A67-18758

MOLECULAR BEAM

BEAM MASER EXCITATION PARAMETER CALCULATIONS  
INCLUDING COLLISION IN BEAM EFFECTS AND COMPARISON  
WITH MOLECULAR FORMALDEHYDE A66-26054

STEADY STATE OSCILLATIONS OF MOLECULAR BEAM LASER  
WITH INHOMOGENEOUS SINUSOIDAL FIELD IN RESONATOR  
A66-32243

HIGH FREQUENCY-STABILITY EM WAVE SOURCE, APPLYING  
THERMAL EXCITATION METHODS TO PENCIL QUANTUM  
GENERATOR IN IR REGION A66-39336

MOLECULE REORIENTATION AND TRANSITION PROBABILITY  
IN MOLECULAR BEAM MASER USING FORMALDEHYDE  
A66-39662

HIGH FREQUENCY-STABILITY EM WAVE SOURCE, APPLYING  
THERMAL EXCITATION METHODS TO PENCIL QUANTUM  
GENERATOR IN IR REGION A66-39706

MASER OSCILLATION INTENSITY AND FREQUENCY  
DEPENDENCE ON CONSTANT ELECTRIC AND MAGNETIC  
FIELDS ACTING ON MOLECULAR BEAM IN FRONT OF  
RESONATOR A67-10396

MOLECULAR COLLISION

ATMOSPHERIC OBSERVATION WITH ADVANCED LIGHT RADAR,  
NOTING EQUIPMENT CHARACTERISTICS, MOLECULAR  
SCATTERING MECHANISM, ETC A66-26133

MOLECULAR GAS LASER Q-SWITCHING TECHNIQUES,  
DETERMINING ROTATIONAL COLLISION SECTIONS FOR  
CARBON DIOXIDE AND CROSS SECTIONS FOR VIBRATIONAL  
RELAXATION A67-16632

MOLECULAR DISSOCIATION

NITRIC OXIDE MOLECULAR LASER OBTAINED BY  
DISSOCIATION OF N O- CL IN PULSED ELECTRICAL  
DISCHARGE A67-12510

MOLECULAR GAS

BREAKDOWN BY NEODYMIUM GLASS LASER RADIATION IN  
ATOMIC AND MOLECULAR GASES, DETERMINING POWER  
DENSITIES, NOTING RELATION OF PRESSURE TO  
BREAKDOWN POWER A66-30938

PASCHEN SERIES LASER LINES IN ATOMIC AND  
MOLECULAR HYDROGEN A66-40892

EXCITATION AND RELAXATION MECHANISMS FOR CLOSED  
MOLECULAR GAS LASER A67-16631

ENERGY LEVELS OF SIMPLE MOLECULAR GASES FOR  
POSSIBLE MOLECULAR LASER MATERIAL  
NASA-CR-80832 A67-14212

MOLECULAR INTERACTION

UNFOCUSED RUBY LASER RADIATION FIELD-BIPHENYL  
COMPOUND INTERACTION, RESULTING LUMINESCENCE AND  
APPARENT MULTIPHOTON ABSORPTION A66-38528

MOLECULAR OSCILLATION

LASER ACTION ON VIBRATIONAL-ROTATIONAL TRANSITIONS  
AND VIBRATION ENERGY TRANSFER A66-26204

MOLECULAR LASER ACTION BY VIBRATIONAL EXCITATION  
OF NITRIC OXIDE DURING FLASH PHOTOLYSIS OF  
NITROSYL CHLORIDE A66-39166

MOLECULAR OSCILLATION DIFFERENCE FREQUENCY  
GENERATION IN IR SPECTRUM BY BEATING TOGETHER  
LASER AND LASER-STIMULATED RAMAN EMISSION  
A66-42544

OSCILLATION AMPLITUDE MODULATION IN AMMONIA BEAM  
MASER OSCILLATOR WITH SINGLE CAVITY FOLLOWED BY  
TWO CAVITIES IN CASCADE A67-16636

MOLECULAR PHYSICS

OPTICAL PHENOMENA IN LIQUID AND GASEOUS MEDIA  
AD-626808 A66-35526

MOLECULAR ROTATION

PHYSICAL MECHANISM OF MOLECULAR LASERS AND  
VIBRATIONAL ROTATION RELATION A66-33246

MOLECULAR SPECTROSCOPY

FAR- IR LASER MOLECULAR SPECTROSCOPY INCLUDING IR  
LASER OSCILLATORS, PHOTON NOISE, DETECTORS AND  
NUCLEAR OPTICS A66-26195

OPTICAL- AND I R-MASER SPECTROSCOPY OF  
INHOMOGENEOUSLY BROADENED RESONANCES, USING GAS  
LASERS A66-26196

MOLECULAR SPECTROSCOPY OF ILLUMINATION EFFECTS ON  
COBALT ACTIVATED ZN S EXPOSED TO RUBY LASER  
PULSES A67-10683

GAS LASER RESEARCH, ATOMIC, MOLECULAR, AND  
INFRARED SPECTROSCOPY TECHNIQUES, AND INTENSE  
LASER BEAM INTERACTION WITH MATTER  
AFCR-66-727 A67-19224

MOLECULAR SPECTRUM

GAS LASER WITH GENERALIZED POLARIZATION  
CHARACTERISTICS, NOTING ROLE OF DEGENERATE ATOMIC  
ENERGY LEVELS A66-36005

LASER INDUCED BREAKDOWN OF COMPLEX ORGANIC  
MOLECULES IN VAPOR STATE, NOTING EMISSION  
ACCOMPANIED BY FORMATION OF PARTIALLY  
DISSOCIATED HOT GAS A67-12451

MOLECULAR STRUCTURE

ABSORPTION SPECTRA IN OPTICAL REGION WHEN LASER  
RADIATION AND CONTINUOUS RADIATION ARE  
SIMULTANEOUSLY INCIDENT ON MOLECULAR MEDIUM  
A66-26161

LASER ACTION IN CLOSED MOLECULAR SYSTEM WITH  
MIXTURE OF CARBON DIOXIDE, NITROGEN AND WATER  
VAPOR, NOTING COUPLING-OUT PLATE REFLECTIVITY AND  
POPULATION INVERSION A66-35433

CHANGES IN GIANT MOLECULE STRUCTURE OF  
POLYPROPYLENE FILMS UNDER ACTION OF LASER PULSES  
ANALYZED BY OPTICAL MICROSCOPY A67-19169

MOLYBDENUM

ENERGY SPECTRA OF IONS EMITTED BY BERYLLIUM,  
CARBON AND MOLYBDENUM HEATED BY LASER  
A66-25479

MOMENTUM TRANSFER

MOMENTUM TRANSFER CAUSED BY FOCUSING LASER GIANT  
PULSE ON SURFACE IN VACUUM INVESTIGATED FOR BE,  
C, AL, ZN, AG AND W A66-35418

MONKEY

RUBY LASER INJURY TO EYE OF MONKEYS, MACACA  
CYNOMOLGUS AND CERCOCEBUS TORQUATUS ATYS  
A67-80364

MONOCHROMATIC RADIATION

HOLOGRAMS AND WAVEFRONT RECONSTRUCTION TECHNIQUES  
INVOLVING PRISMATIC REFRACTION OF MONOCHROMATIC  
AND COHERENT LASER LIGHT CAUSING INTERFERENCE  
PATTERN ON PHOTOGRAPHIC EMULSION  
A66-25144

RUBY LASER MONOCHROMATIC RADIATION SEPARATION BY  
TAPERED MULTIPLEX INTERFEROMETER WITH OPPOSITION  
DISPERSION A66-26471

LASER DOPPLER VELOCIMETER FOR MEASURING LOCALIZED  
FLOW VELOCITIES IN LIQUIDS A66-27053

OBTAINING HIGHLY MONOCHROMATIC RADIATION ON SINGLE  
WAVE FROM RUBY LASER A66-31809

DYNAMIC PHOTOELASTICITY MEASUREMENTS OF STRESS  
CONCENTRATION, USING RUBY LASER MONOCHROMATIC  
LIGHT SOURCE A66-34557

INTENSITY DEPENDENT FREQUENCY SHIFT IN SPECTRAL  
OUTPUT OF MONOCHROMATIC GIANT PULSE LASERS  
MEASURED, USING FABRY-PEROT INTERFEROMETER  
A67-10251

LASER CHARACTERISTICS OF NARROW BAND TYPE I SOLAR  
RADIO BURST AND MAGNETIC DIPOLE TRANSITIONS IN  
SPLIT ZEEMAN SUBLEVELS OF HYDROGEN ATOMS OF  
SOLAR CORONA IN GROUND LEVEL A67-11652

#### MONOCHROMATOR

ALIGNMENT OF ANGULAR POSITIONS OF SPHERICAL MIRROR  
AND GRATING OF FASTIE-EBERT SPECTROMETER, USING  
BRIGHT COLLIMATED MONOCHROMATIC BEAM OF HE-NE  
LASER A66-26564

#### MONTE CARLO METHOD

MONTE CARLO TECHNIQUE TO DETERMINE TOTAL ENERGY  
AND ENERGY DISTRIBUTION IN LASER CRYSTAL DUE TO  
OPTICAL PUMPING A66-26028

TRANSFER EFFICIENCY OF LASER PUMPING CAVITIES WITH  
DIFFUSELY REFLECTING WALL DETERMINED, BASED ON  
APPROXIMATELY ISOTROPIC NATURE OF LIGHT INSIDE  
CAVITY A66-35379

#### MOON

MEASUREMENT OF DISTANCE TO MOON BY OPTICAL  
RADAR, DISCUSSING RUBY LASER/PHOTOMULTIPLIER  
APPARATUS AND PROCEDURE A66-30291

#### MULTILAYER STRUCTURE

TEMPERATURE DISTRIBUTION IN TWO-LAYER PLATE DURING  
WELDING BY LASER LIGHT FLUX A66-40194

TEMPERATURE DISTRIBUTION IN TWO-LAYER PLATE  
DURING WELDING BY LASER LIGHT FLUX  
A67-17548

#### MULTIMODE RESONATOR

MULTIMODE RUBY RESONATOR OUTPUT AS AFFECTED BY  
MODE NUMBER AND MODE DEGENERACY  
A66-25043

INTENSITY AND FREQUENCY EQUATIONS FOR INTERBAND  
OPTICAL TRANSITIONS AND MULTIMODE PROPERTIES IN  
SEMICONDUCTOR LASERS A66-39666

MULTIMODE OSCILLATIONS OF SOLID STATE LASER UNDER  
STATIONARY CONDITIONS EXTENDED TO TREAT CAVITIES  
WITH LOSSY END MIRRORS OR WITH FREQUENCY  
DEPENDENT LOSSES  
AFCRL-66-384 N66-33524

RAMAN GENERATOR FOR AMPLIFICATION OF COHERENT  
RADIATION, AND SPECTRAL CHARACTERISTICS OF  
GAS LASER WITH ONE DIRECTION TRAVELING WAVE  
PROPAGATION  
FTD-MT-65-399 N67-11313

MULTIMODALITY OF GAS LASER IN RESONATOR WITH  
ONE DIRECTION TRAVELING WAVE PROPAGATION  
N67-11315

## N

#### N-TYPE SEMICONDUCTOR

IMPURITY CONCENTRATION EFFECT ON MAXIMUM  
CONTINUOUS WAVE POWER FROM GALLIUM ARSENIDE LASERS  
AT 77 DEGREES K A66-37782

SPONTANEOUS AND STIMULATED EMISSION FROM GA AS  
DIODES WITH THREE-LAYER STRUCTURES CONSISTING OF  
N-N-P, N-I-P OR N-P-P DIODES A66-40102

INELASTIC SCATTERING OF CARBON DIOXIDE LASER  
RADIATION BY MOBILE LANDAU-LEVEL ELECTRONS IN N-  
IN SB A67-17723

#### NATURAL FREQUENCY

NATURAL MODES OF PLANE AND CYLINDRICAL DIELECTRIC  
RESONATORS IN OPTICAL BAND A66-26042

POLARIZATION OF PULSED RADIATION FROM GA AS LASER  
DIODE TO DETERMINE ORIGIN OF NATURAL OSCILLATIONS  
OF RESONATOR A66-37549

#### NAVIGATION AND GUIDANCE

RING LASER SENSOR PARAMETERS AND CHARACTERISTICS,  
NOTING APPLICATION TO MEASUREMENT OF ANGULAR RATE,  
MASS FLOW, NAVIGATION AND GUIDANCE  
A66-35533

#### NEODYMIUM

THRESHOLD DATA FOR RUBY AND NEODYMIUM LASER  
PULSE-INDUCED BREAKDOWN IN Xe, Ar, Kr, Ne,  
He, OXYGEN, NITROGEN, AIR AND CARBON DIOXIDE  
A66-26191

NEODYMIUM-DOPED YTTRIUM-ALUMINUM GARNET CRYSTAL  
LASER OSCILLATOR AS REGENERATIVE AMPLIFIER OF  
NOISE A66-26212

SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-  
PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION  
A66-27187

FAST-ACTING FLUID SEAL FOR Q-FACTOR MODULATION OF  
NEODYMIUM GLASS LASER A66-27595

EXPERIMENTAL OBSERVATION OF REGULAR SPIKING IN  
NEODYMIUM DOPED GLASS LASER ROD ATTRIBUTED TO  
SIMULTANEOUS OSCILLATION OF MANY TRANSVERSE AND  
LONGITUDINAL MODES A66-28727

GIANT PULSES FROM NEODYMIUM GLASS LASER PUMPED BY  
GIANT PULSES FROM RUBY LASER A66-31354

LOW THRESHOLD NEODYMIUM GLASS LASER OSCILLATOR  
WITH HIGH REPETITION A66-33325

SECOND HARMONIC FREQUENCY GENERATION OBTAINED IN  
PROCESS OF OPTICAL MIXING OF COLLINER NEODYMIUM  
LASER BEAMS IN POTASSIUM DIHYDROGEN PHOSPHATE  
A66-37550

PULSED-MODE GAIN CHARACTERISTICS IN NEODYMIUM-  
DOPED SILICATE GLASS LASER EXPERIMENTALLY RELATED  
TO GIANT-PULSE LASER ENERGY OUTPUT  
A66-38396

TRIVALENT NEODYMIUM IN SELENIUM OXYCHLORIDE,  
INORGANIC LIQUID LASER WITHOUT LIMITATIONS OF  
EUROPIUM CHELATES AND MATCHING IN THRESHOLD AND  
OUTPUT NEODYMIUM-DOPED CRYSTALS  
A66-39110

PERFORMANCE CHARACTERISTICS OF ROOM TEMPERATURE  
LIQUID LASER, USING TRIVALENT ION NEODYMIUM-DOPED  
SELENIUM OXYCHLORIDE A66-39111

OPTICAL SPECTRA OF ULTRASHORT OPTICAL PULSES  
GENERATED BY MODE-LOCKED GLASS-DOPED NEODYMIUM  
LASERS, CONSIDERING SATURABLE ABSORBER CELL PLACED  
PARALLEL TO FABRY-PEROT REFLECTOR  
A66-39115

NEODYMIUM LASER OSCILLATOR USING TIME-VARIABLE  
REFLECTOR, NOTING LOADING AND DUMPING OF OPTICAL  
CAVITY WITH NEARLY MAXIMUM AMOUNT OF ENERGY  
A66-39118

STIMULATED EMISSION, ABSORPTION SPECTRA AND  
LUMINESCENCE OF NEODYMIUM-ACTIVATED YAG CRYSTALS  
IN PULSED LASER A66-39306

NEODYMIUM DOPED GLASS LASER USING SATURABLE LIQUID  
Q-SWITCH A66-41033

DEPENDENCE OF BEAT FREQUENCY OF NEODYMIUM LASER  
AXIAL MODES ON DISTANCE BETWEEN MIRRORS AND  
NEODYMIUM ROD POSITION WITHIN RESONATOR  
A66-41088



- FAST-ACTING FLUID SEAL FOR Q-FACTOR MODULATION OF NEODYMIUM GLASS LASER A66-42729
- RADIATION OF GIANT PULSES OF SUPERLUMINESCENCE BY HIGHLY EXCITED ACTIVE MEDIUM OF ND GLASS WITH RAPID CUT-IN OF AMPLIFICATION A66-42755
- GLASS LASERS, COMPARING GLASS WITH CRYSTALS AS HOSTS FOR LASER IONS, CONSIDERING NEODYMIUM LASER PROPERTIES A66-42800
- SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION A66-43085
- THERMALLY INDUCED EFFECTS ON RUBY AND NEODYMIUM IN GLASS LASER RODS A66-26341
- AFCL-66-57 N66-26341
- CESIUM VAPOR USED FOR TRANSFORMER LASER TO BE OPTICALLY PUMPED BY BATTERY OF NEODYMIUM LASERS GPL-A-31-3 N66-33813
- RADIATION OF GIANT PULSES OF SUPERLUMINESCENCE BY HIGHLY EXCITED ACTIVE MEDIUM OF ND GLASS WITH RAPID CUT-IN OF AMPLIFICATION A67-10837
- TEMPERATURE DEPENDENCE OF THRESHOLD FOR STIMULATED EMISSION OF ND TRIVALENT ION IN SEVERAL HOST LATTICES ESTIMATED FROM INTENSITY VARIATION OF LASER ACTIVE FLUORESCENCE COMPONENT A67-11085
- FLUORESCENT EMISSION OF NEODYMIUM LASER TRIGGERED BY POKELS EFFECT AS FUNCTION OF POPULATION INVERSION A67-13201
- OUTPUT SPECTRA OF ND DOPED YAG AND RUBY LASERS, DETERMINING MECHANISMS RESPONSIBLE FOR OBSERVED OVERALL LINEWIDTHS A67-16660
- TERMINAL LEVEL LIFETIME AND FLUORESCENCE LINE OF NEODYMIUM DOPED GLASS INFLUENCE ON DYNAMICS AND EFFICIENCY OF Q-SPOILED LASER A67-16675
- NEODYMIUM DOPED OPTICAL GLASSES FOR LASER TECHNOLOGY A67-16855
- CALCIUM FLUORIDE-CERIUM FLUORIDE WITH NEODYMIUM ADDITIONS AS ACTIVE MEDIUM FOR LASERS, DISCUSSING ABSORPTION AND LUMINESCENCE SPECTRA AND INDUCED RADIATION A67-16922
- NEODYMIUM GLASS LASER TIME CHARACTERISTICS AND SPECTRAL CHANGES DURING CONVERSION TO TRAVELING WAVE LASER A67-18782
- NEODYMIUM GLASS LASER WITH SPHERICAL MIRROR RESONATOR IN STATIONARY REGIME A67-18783
- COMPARISON OF NEODYMIUM DOPED HIGH ENERGY LASER GLASS MATERIAL TO STANDARD SILICATE BASED GLASS AD-640097 N67-16363
- AUTOMATIC LASER BEAM DETECTOR AND INSTANTANEOUS TRANSVERSE ELECTROMAGNETIC MODE ANALYSIS OF HELIUM-NEODYMIUM LASER N67-16952
- NEODYMIUM COMPOUND**
- GIANT PULSE FORMATION THEORY, MEASURING SHAPE AND DURATION OF NEODYMIUM GLASS LASER PULSES FOR VARIOUS VALUES OF INVERSE POPULATION A66-37367
- NEODYMIUM-GLASS LASER USING SPONTANEOUS AMPLIFIED EMISSION IN NONRESONANT SYSTEM TO OBTAIN HIGH BRIGHTNESS OUTPUT PULSE A67-15100
- GIANT PULSE FORMATION THEORY, MEASURING SHAPE AND DURATION OF NEODYMIUM GLASS LASER PULSES FOR VARIOUS VALUES OF INVERSE POPULATION A67-17876
- NEON**
- OUTPUT POWER OF 6328 ANGSTROM HE- NE GAS LASER AS FUNCTION OF LASER GAIN, CAVITY LOSS AND OUTPUT COUPLING A66-25651
- HELIUM-NEON GAS LASER USED TO STUDY PRESSURE EFFECT ON LINE SHAPE OF 2S-2P OPTICAL TRANSITIONS OF NEON EXCITED STATES A66-26198
- HELIUM-NEON GAS LASER USED TO DETERMINE ELECTRON DENSITY VARIATION, SPATIAL AND TEMPORAL, IN AFTERGLOW OF Z-PINCH IN H AT 100 MTORR A66-26239
- NEON LEVEL BROADENING UNDER EFFECT OF LASER RADIATION STUDIED BY OBSERVING HANLE EFFECT ON FLUORESCENT LIGHT A66-29640
- HIGH-POWER MOLECULAR LASER BASED ON VIBRATIONAL-ROTATIONAL ENERGY LEVEL, NOTING CARBON DIOXIDE-NEON-HELIUM LASER DESIGN A66-33248
- MEASURING AMPLIFICATION OF COHERENT OPTICAL RADIATION IN NEON-HELIUM FILLED TUBE A66-33512
- NONRECIPROCAL EFFECTS ASSOCIATED WITH EXCITATION CURRENT OBSERVED IN D C-EXCITED HE- NE RING LASER, NOTING COUPLING PHENOMENA BETWEEN RIGHT AND LEFT WAVES A66-37408
- MAGNITUDE OF HANLE EFFECT OF NEON ATOMS EMITTED BY LASER DEPENDENCE ON EXCITATION DISCHARGE INTENSITY EXPLAINED BY MULTIPLE COHERENT DIFFUSION AT METASTABLE LEVEL A66-37409
- INTRACAVITY INTERFEROMETER LASER MEASUREMENTS OF POWER GAIN AND OUTPUT IN SINGLE-FREQUENCY AR LASER AND 6328-ANGSTROM NE ISOTOPE SHIFT A66-40110
- MEASURING AMPLIFICATION OF COHERENT OPTICAL RADIATION IN NEON-HELIUM FILLED TUBE A66-42125
- PROPERTIES OF FM AND SUPER-MODE HELIUM-NEON LASERS, AND ABSOLUTE FREQUENCY STABILIZATION OF FM LASER IER-4 N66-35096
- MICROWAVE MODULATION OF HELIUM-NEON LASER INTENSITY STUDIED AS FUNCTION OF TEMPERATURE AND ELECTRON DENSITY A67-10260
- COUPLING OF PULSE POWERS IN TEM OF UP TO 80 MW FROM HE- NE LASER AT 6328 ANGSTROMS A67-13678
- CONSTRUCTION METHODS OF DC OPERATED HE/ NE LASER TUBES USING OPTICAL CONTACT BONDS A67-14763
- DOUBLE RESONANCE EFFECTS EXTENDED TO CASE OF STIMULATED EMISSION IN EXCITED STATES OF NEON, USING GAS LASER IN TRANSVERSE DC MAGNETIC FIELD A67-16645
- NETWORK**
- GASEOUS LASER OUTPUT EXPRESSED IN SINGLE OR TWO-LINE OSCILLATIONS AS FUNCTION OF PUMPING RATES AND TRANSITION PROBABILITIES, CONSIDERING CONCEPT OF EQUIVALENT NETWORK A67-16979
- NETWORK ANALYSIS**
- REFLECTING MIRRORS IN LASER OSCILLATORS TREATED AS REFLECTING ELEMENTS AND TRANSDUCERS FOR COUPLING POWER FROM OSCILLATOR TO EXTERNAL SPACE A66-40184
- NETWORK SYNTHESIS**
- PULSE GENERATOR FOR DRIVING SEMICONDUCTOR LASER DIODE, NOTING CIRCUIT DIAGRAM AND OPERATING CHARACTERISTICS A66-37588
- NEUTRAL PARTICLE**
- ELECTRON AND NEUTRAL ATOM DENSITIES IN HELIUM AND ARGON AFTERGLOW PLASMA OBTAINED BY TWO HELIUM-NEON LASER INTERFEROMETERS, NOTING TEMPORAL DEPENDENCE OF ELECTRON DECAY A66-41364
- NICKEL-CADMIUM BATTERY**
- BIPOLAR NI- CD CELLS FOR RUBY LASERS AND POWER SOURCES TO YIELD HIGH ENERGY PULSES FOR FIRING PYROTECHNIC DEVICES A66-41760

## NITRIC OXIDE

MOLECULAR LASER ACTION BY VIBRATIONAL EXCITATION  
OF NITRIC OXIDE DURING FLASH PHOTOLYSIS OF  
NITROSYL CHLORIDE A66-39166

NITRIC OXIDE MOLECULAR LASER OBTAINED BY  
DISSOCIATION OF N O- CL IN PULSED ELECTRICAL  
DISCHARGE A67-12510

## NITROBENZENE

LASER GIANT PULSE DAMAGE TO DIELECTRIC MIRROR  
COATINGS IMMERSSED IN NITROBENZENE SOLUTION A66-36075

## NITROGEN

PULSED COAXIAL TRANSMISSION LINE NITROGEN GAS  
LASER, NOTING PRESSURE EFFECT A66-40107

SPECTROSCOPY OF IR EMISSION AND LASER OSCILLATION  
RESULTING FROM TRANSIENT POPULATION INVERSIONS ON  
ELECTRONIC TRANSITIONS IN MOLECULAR NITROGEN A66-42550

NITROGEN-CARBON DIOXIDE 10.6 MICRON LASER FOR  
OPTICAL TRACKING SYSTEM N66-31161

STIMULATED BRILLOUIN EFFECT IN HIGH PRESSURE  
GASEOUS NITROGEN, METHANE, AND CARBON DIOXIDE  
USING GIANT PULSE LASER N66-35533

OPTIMIZATION OF HIGH-POWER CONTINUOUS-WAVE GAS  
LASER HAVING CARBON DIOXIDE, NITROGEN, AND HELIUM  
MIXTURE AS ACTIVE MEDIUM N66-38449

STIMULATED EMISSION IN TRIPLET SYSTEM OF NITROGEN  
MOLECULE PRODUCED BY PULSED LASER DISCHARGE,  
IDENTIFYING LINES AND INTERPRETING INTENSITY  
DISTRIBUTION IN ROTATIONAL BAND SPECTRUM A67-16785

ION LASER EXPERIMENTS, MOLECULAR NITROGEN LASER,  
AND GAS LASER THEORY N67-12649

## NITROGEN OXIDE

DETECTING CONCENTRATION OF NITRIC OXIDE IN  
METASTABLE STATE IN UPPER ATMOSPHERE, USING GIANT-  
PULSE RAMAN LASER SOURCES A66-43022

THERMALLY EXCITED INFRARED BEAM LASER USING  
CARBON DIOXIDE, NITROGEN OXIDE, AND HYDROCYANIC  
ACID MOLECULAR ENERGY LEVELS N67-15769

## NITROSYL CHLORIDE

MOLECULAR LASER ACTION BY VIBRATIONAL EXCITATION  
OF NITRIC OXIDE DURING FLASH PHOTOLYSIS OF  
NITROSYL CHLORIDE A66-39166

## NOISE

CORRELATIONS AND INTENSITY FLUCTUATIONS IN LIGHT  
FROM INDIVIDUAL LASING AND NONLASING MODES OF CW  
GA AS LASER AND THRESHOLD NOISE CHANGE IN LASER  
EMISSION A66-26210

PHOTOELECTRON COUNTS OF PHOTOMULTIPLIER  
ILLUMINATED BY GAS LASER LIGHT SOURCE A66-26211

NEODYMIUM-DOPED YTTRIUM-ALUMINUM GARNET CRYSTAL  
LASER OSCILLATOR AS REGENERATIVE AMPLIFIER OF  
NOISE A66-26212

NONLINEAR QUANTUM MECHANICAL ANALYSIS OF LASER  
STEADY MOTION, STABILITY UNDER DEVIATIONS AND  
NOISE EFFECT ON LINE WIDTH AND INTENSITY  
FLUCTUATIONS A66-26213

## NOISE ELIMINATION

EXCESS PHOTON NOISE IN DETECTED PHOTOCURRENT OF  
MULTIMODE LASER FOR UNCOUPLED AND PHASE LOCKED  
MODES A67-16623

## NOISE INTENSITY

SOLAR NOISE IN OPTICAL COMMUNICATIONS, BACKGROUND  
RADIATION DEPENDENCE ON DETECTOR APERTURE, NOISE  
POWER AND APPLICATION TO GA AS DIODES AND GAS  
LASERS A66-25833

SPONTANEOUS EMISSION NOISE POWER ADDED TO  
AMPLIFIED SIGNAL IN LASER AMPLIFIER IN HE- XE GAS  
DISCHARGE AND SATURATION RELATION TO POPULATION  
INVERSION A66-38387

PHASE AND AMPLITUDE FLUCTUATION OF GAS AND SOLID  
STATE LASERS, ACCOUNTING FOR NOISE CAUSED BY  
PUMPING, INCOHERENT DECAY, LATTICE VIBRATIONS AND  
ATOMIC COLLISIONS A67-14949

INTRINSIC NOISE TEMPERATURE MEASUREMENT IN  
REFLECTION TYPE CAVITY MASER A67-17892

## NOISE MEASUREMENT

RELATIONSHIP BETWEEN AMPLIFICATION, BANDWIDTH AND  
NOISE TEMPERATURE IN MASER AMPLIFIER, CONSIDERING  
PARAMAGNETIC PERMEABILITY AND Q-FACTOR A66-29051

INTENSITY NOISE IN MULTIMODE GA AS LASER EMISSION  
A66-32689

SINGLE CAVITY MICROWAVE LASER AMPLIFIER ANALYSIS,  
DETERMINING GAIN, BANDWIDTH, NOISE, CAVITY Q-  
FACTOR EFFECT AND WIDTH OF MAGNETIC RESONANCE LINE  
A66-37583

DISCHARGE CURRENT AND LASER LIGHT NOISE  
MEASUREMENTS EFFECT IN GAS DISCHARGE HELIUM-NEON  
LASER, USING EQUIVALENT CIRCUIT A66-38240

RADIATION NOISE EFFECT ON LASER OPTICAL  
PROPERTIES, NOTING DENSITY VS RESONATOR  
CHARACTERISTICS, ENERGY SPECTRUM, ETC A66-40917

PLASMA FLUCTUATION EFFECT ON GAS LASER NOISE,  
NOTING RELATION BETWEEN MODULATION AMPLITUDE OF  
LIGHT OUTPUT AND FREQUENCY NOISE AND OSCILLATION  
SPECTRUM A66-41294

LOW NOISE RECEIVERS - TRAVELING WAVE MASER  
DEVELOPMENT N67-15913

## NOISE REDUCTION

LOW NOISE PHOTODIODES WITH AVALANCHE  
MULTIPLICATION FOR HIGH SENSITIVITY, NOTING  
CAPABILITY FOR LOW INTENSITY WIDEBAND SIGNAL  
DETECTION, PERFORMANCE IN IR REGION, ETC A66-31934

## NOISE SPECTRUM

BOOK ON LASER RECEIVERS COVERING NOISE  
PERFORMANCE, ATMOSPHERIC EFFECTS, DETECTION  
TECHNIQUES, HARDWARE AND SYSTEMS AVAILABLE,  
OPTICAL COMMUNICATION IN VISIBLE AND IR SPECTRUM,  
ETC A66-36060

COHERENT HOMODYNE DETECTION AT 10.6 MICROMETERS  
WITH ALUMINUM-DOPED SILICON PHOTOCONDUCTOR,  
PRESENTING NOISE SPECTRA AND VOLTAGE A67-13989

GENERALIZED CALLEN- WELTON THEOREM APPLIED TO  
CALCULATION OF MASER OSCILLATIONS IN AMPLIFICATION  
AND GENERATION REGIMES, DETERMINING NOISE SPECTRAL  
ENERGY AND SPECTRAL LINE WIDTH A67-16350

## NOISE THRESHOLD

SMALL SIGNAL MODULATION EFFECT ON PHOTOELECTRON  
COUNTING OF HE- NE LASER INTENSITY FLUCTUATIONS  
A66-31097

LINE WIDTH OF WELL-STABILIZED LASER OPERATING FAR  
ABOVE THRESHOLD DETERMINED BY PHASE RANDOM  
FLUCTUATION, USING INTERFEROMETER A66-39394

## NONLINEAR FILTER

SPONTANEOUS EMISSION SPECTRA AND RATIO OF NUMBER  
OF PHOTONS IN VARIOUS OSCILLATION MODES OF LASER  
WITH NONLINEAR FILTER TYPE LOCK A67-11573

## NONLINEARITY

NONLINEAR OPTICS, CONSIDERING MAXWELL EQUATION  
AND NONLINEAR MATERIAL RESPONSE A66-26964

- OPTICAL NONLINEARITIES DUE TO CONDUCTION BAND  
ELECTRONS IN IN AS, IN SB, GA AS AND PB TE  
STUDIED, USING Q-SWITCHED CARBON DIOXIDE LASER  
RADIATION A67-12524
- NOZZLE FLOW**  
PARTICLE VELOCITY IN GAS PARTICLE TWO-PHASE NOZZLE  
EXPANSION USING GAS LASER AND FABRY-PEROT  
INTERFEROMETER FOR ROCKET ENGINE PROPULSION  
AIAA PAPER 66-522 A66-31500
- NUCLEAR RADIATION**  
FISSION OR RADIOISOTOPIC NUCLEAR RADIATION APPLIED  
TO LASER PUMPING, DISCUSSING FORMS, SOURCES,  
POWER, SOLID STATE AND MOLECULAR GAS LASERS,  
ENERGY TRANSFER, OPTICAL FLUORESCENCE AND CUT-OFF  
PHENOMENON A67-16547
- NUCLEAR SPECTROSCOPY**  
FAR-IR LASER MOLECULAR SPECTROSCOPY INCLUDING IR  
LASER OSCILLATORS, PHOTON NOISE, DETECTORS AND  
NUCLEAR OPTICS A66-26195
- NUCLEATE BOILING**  
BUBBLE GROWTH PARAMETERS IN SATURATED AND  
SUBCOOLED NUCLEATE BOILING AND ANALYSIS OF  
SINGLE BUBBLE GENERATED BY USING LASER BEAM  
ON THERMOCOUPLE OR FLAT PLAT SUBMERGED IN WATER  
NASA-CR-81673 N67-17962
- OCEANOGRAPHY**  
UNDERWATER LIGHT TRANSMISSION FROM LASERS AND  
CONVENTIONAL LIGHT SOURCES  
AD-631033 N66-27790
- ONE-DIMENSIONAL FLOW**  
ONE-DIMENSIONAL HEAT FLOW EQUATION FOR LIQUID  
NITROGEN END-COOLED RUBY LASER ROD  
A66-38386
- OPHTHALMOLOGY**  
BIOMEDICAL PREPARATIONS FOR MANNED LUNAR LANDING,  
COLD ACCLIMATIZATION IN FAR NORTH, AND LASERS IN  
OPHTHALMOLOGY  
JPRS-36229 N66-33200
- OPTICAL ABSORPTION**  
ABSORPTION SPECTRA IN OPTICAL REGION WHEN LASER  
RADIATION AND CONTINUOUS RADIATION ARE  
SIMULTANEOUSLY INCIDENT ON MOLECULAR MEDIUM  
A66-26161
- ELECTRICAL BREAKDOWN OF GASES BY OPTICAL FREQUENCY  
RADIATION, NOTING LASER BEAM ATTENUATION AND  
SUBSEQUENT ENERGY ABSORPTION BY PLASMA  
A66-26190
- SATURABLE OPTICAL ABSORPTION OF LIGHT FLUX FROM  
HIGH INTENSITY Q-SWITCHED RUBY LASER  
A67-16677
- DAMAGE IN GLASS INDUCED BY LINEAR ABSORPTION OF  
LASER RADIATION NON-Q-SPOILED A67-16794
- OPTICAL AMPLIFIER**  
RUBY LASER AMPLIFIER DYNAMICS, NOTING AMPLIFICATION  
IN ENERGY GAIN REGIMES AND CORRELATION TO  
THEORETICAL EQUATIONS A66-25049
- AMPLIFICATION OF INTERACTION OF ATOMS AND OF  
PULSED OR PERIODIC COOLING OF TRANSPARENT MEDIA  
PRODUCED BY LASER BEAM, NOTING CHANGES IN KINETIC  
ENERGY OF ATOMS A66-26021
- STEADY STATE VARIATION OF LIGHT INTENSITY WITH  
DISTANCE FOR MONOCHROMATIC LIGHT, NOTING  
DEPENDENCE OF ABSORPTION COEFFICIENT ON DEGREE OF  
EXCITATION OF ELECTRONIC SYSTEM A66-26183
- SINGLE CAVITY MICROWAVE LASER AMPLIFIER ANALYSIS,  
DETERMINING GAIN, BANDWIDTH, NOISE, CAVITY Q-  
FACTOR EFFECT AND WIDTH OF MAGNETIC RESONANCE LINE  
A66-37583
- SPONTANEOUS EMISSION NOISE POWER ADDED TO  
AMPLIFIED SIGNAL IN LASER AMPLIFIER IN HE-XE GAS
- DISCHARGE AND SATURATION RELATION TO POPULATION  
INVERSION A66-38387
- SHORT PULSE Q-SWITCHED LASER WITH VARIABLE PULSE  
LENGTH A67-16641
- OPTICAL PULSE AMPLIFIERS WITH ACTIVE SATURABLE  
ABSORPTION SWITCHES N67-13064
- OPTICAL BEAM SCANNING**  
MEASUREMENTS OF MASER BEAM PROPAGATED THROUGH  
ATMOSPHERE, EMPHASIZING BEAM BROADENING AND SIGNAL  
FLUCTUATION DUE TO CLEAR AIR TURBULENCE A66-28581
- PERSPECTIVE RENDERING OF FIELD INTENSITY  
DIFFRACTED AT CIRCULAR APERTURE WITH REFERENCE TO  
LASER-SCANNING TECHNIQUE A66-28843
- ACQUISITION AND REACQUISITION IN SPACECRAFT-  
SPACECRAFT AND SPACECRAFT-TO-EARTH COMMUNICATIONS  
USING LASER SYSTEMS A66-33795
- LASER BEAM DEFLECTION AND SCANNING TECHNIQUES  
A66-42817
- DATA RECORD AND READOUT SYSTEMS DEPENDENCE ON  
PRECISE SPOT AND LINE SCAN METHODS, USING  
DIFFRACTION LIMITED SPOTS OF LASER GENERATED LIGHT  
A67-15321
- DIFFRACTION LIMITED PERFORMANCE ACHIEVED FOR  
FLYING SPOT RECORDING AND READOUT, USING  
CONCENTRIC OPTICAL SYSTEM, APPLIED TO LASER  
SCANNER A67-15322
- THERMAL HIGH RESOLUTION RECORDING USING MOVING  
LASER SPOT ON METALLIC AND ORGANIC THIN FILMS  
A67-16586
- ELECTRON BEAM SPATIAL SCANNING OF COHERENT  
EMISSION OF GA AS JUNCTION LASER AT LOW  
TEMPERATURES, MAKING CURRENT DISTRIBUTION  
NONUNIFORM A67-18150
- OPTICAL CORRECTION PROCEDURE**  
ADJUSTMENT PROCEDURE FOR LASER WITH POLYGONAL  
RESONATOR, NOTING SPATIAL MIRROR ADJUSTMENT IN  
ADDITION TO ANGULAR ADJUSTMENT A66-25323
- ADJUSTMENT PROCEDURE FOR LASER WITH POLYGONAL  
RESONATOR, NOTING SPATIAL MIRROR ADJUSTMENT IN  
ADDITION TO ANGULAR ADJUSTMENT A67-10162
- LASER BRIGHTNESS GAIN AND SINGLE TRANSVERSE MODE  
OPERATION BY COMPENSATION FOR THERMAL DISTORTION  
WITH EXTERNAL MIRROR A67-16656
- OPTICAL COUPLING**  
PHASE LOCKING OF ONE LASER TO ANOTHER BY DIRECT  
INJECTION OF FIRST LASER BEAM INTO SECOND LASER  
CAVITY A66-26593
- FABRY-PEROT ETALON USE FOR INTERFEROMETRY AND  
LASER CONTROL, NOTING LOW ANGLE SCATTERING, LASER  
OSCILLATION, THERMAL TUNING SENSITIVITY, ETC  
A66-32619
- NONRECIPROCAL EFFECTS ASSOCIATED WITH EXCITATION  
CURRENT OBSERVED IN D C-EXCITED HE-NE RING  
LASER, NOTING COUPLING PHENOMENA BETWEEN RIGHT  
AND LEFT WAVES A66-37408
- OPTICAL COUPLING USING GALLIUM ARSENIDE LASER FOR  
VARIATION OF FREQUENCY OF DIODE EMISSION THROUGH  
SMALL CHANGE IN CURRENT DENSITY A66-38920
- TIME DEPENDENCY OF PHASE DIFFERENCE OF TWO  
WEAKLY COUPLED NONLINEAR OPTICAL OSCILLATORS,  
CONSIDERING COUPLING OF TWO TRAVELING WAVES IN  
LASER A66-42257
- RADIATION INTERACTION BETWEEN LASER OSCILLATORS  
WITH DIFFERENT ACTIVE MATERIALS AND FREQUENCIES  
A66-42549
- MODE COUPLING IN RUBY LASER WITH REACTANCE PLACED  
WITHIN CAVITY RESONATOR WITH MODULATION FREQUENCY

- CLOSE TO SEPARATION OF AXIAL MODES, EXAMINING  
ELECTRIC FIELD ENVELOPE A66-42565
- COUPLING MECHANISM IN PASSIVE Q-SWITCHING  
OPERATION BETWEEN FILAMENTS AT DIFFERENT REGIONS  
OF RUBY LASER ROD A67-10813
- OPTICAL COUPLING USING GALLIUM ARSENIDE LASER FOR  
VARIATION OF FREQUENCY OF DIODE EMISSION THROUGH  
SMALL CHANGE IN CURRENT DENSITY A67-16390
- OPTICAL DENSITY**  
LASER SYSTEM FOR METEOROLOGICAL DATA USING  
OSCILLOSCOPE TO DISPLAY RETURN SIGNAL, TRANSLATED  
AS CONCENTRATIONS OF MATTER OR AEROSOLS A66-43044
- OPTICAL EMISSION**  
OPTICAL EXCITATION IN INDIUM ARSENIDE AND GALLIUM  
ANTIMONIDE YIELDING LASER RADIATION A66-25438
- OPTICAL EMISSION FROM RUBY INDUCED BY SHORT  
PULSES OF RELATIVISTIC ELECTRONS IN WHICH  
ELECTRON-HOLE RECOMBINATION PRODUCES EXCITATION OF  
EMISSION A66-26173
- ELECTRICAL BREAKDOWN OF GASES BY OPTICAL FREQUENCY  
RADIATION, NOTING LASER BEAM ATTENUATION AND  
SUBSEQUENT ENERGY ABSORPTION BY PLASMA A66-26190
- RUBY PHOSPHORESCENCE UNDER INTENSE OPTICAL  
EXCITATION, INFERRING POSSIBLE RECOMBINATION  
CHARACTERISTICS FROM INITIAL BRIGHTNESS DECAY A66-28607
- GIANT OPTICAL RADIATION PULSES FROM RUBY LASERS  
BY CONTROL OF STATIC CAVITY GEOMETRY TR-4 N67-10950
- OPTICAL EMISSION SPECTROSCOPY**  
ATOMIC IONIZATION BY INTENSE OPTICAL FIELD, NOTING  
RUBY LASER-PULSE EFFECT ON INERT GAS BETWEEN  
ELECTRODES A66-26189
- SPECTRAL CHARACTERISTICS OF TWO-PHOTON OPTICAL  
EXCITATION AND LIGHT EMISSION FROM CD SE  
SEMICONDUCTOR LASER WITH MODULATED Q-FACTOR A66-37565
- SPECTRAL CHARACTERISTICS OF TWO-PHOTON OPTICAL  
EXCITATION AND LIGHT EMISSION FROM CD SE  
SEMICONDUCTOR LASER WITH MODULATED Q-FACTOR A67-15299
- HIGH POWER LASER RESEARCH - LASER MATERIAL  
EVALUATION, STIMULATED OUTPUT AND Q-SWITCHING,  
SELF-FOCUSING IN LIQUIDS, AND FLASH LAMP  
SPECTROSCOPY NRL-6444 N67-12645
- TIME RESOLVED SPECTROSCOPY OF FLASHLAMP PULSES N67-12652
- OPTICAL EQUIPMENT**  
OPTICAL BEAM DEFLECTION TECHNIQUE USING  
INTERFEROMETER CAVITY ILLUMINATED BY GAS LASER  
BEAM A66-28689
- EQUIPMENT DESCRIPTIONS AND PROCEDURES FOR LASER  
COMMUNICATION SATELLITE EXPERIMENT / LCSE/  
NASA-CR-77462 N66-35171
- OPTICAL METHODS AND EQUIPMENT USED IN CHECKING  
SURFACE FINISH AND VOLUME AND SURFACE  
INHOMOGENEITIES OF ACTIVE MEDIA AND  
INTERFEROMETRIC MIRRORS OF LASERS A67-13143
- OPTICAL SYSTEM CONSISTING OF POLARIZED LASER BEAMS  
FOR MONITORING MISSILE ATTITUDE DURING EARLY  
LAUNCH PHASE A67-14505
- LASER DISPLAYS APPLICATION, PERFORMANCE AND STATUS  
OF EXISTING DEVICES A67-17887
- RADIO ELECTRONICS, DISCUSSING QUANTUM ELECTRONICS,  
LASERS, MICROWAVE DEVICES AND TECHNOLOGY, PLASMA  
PHYSICS, ETC A67-18072
- OPTICAL FILTER**  
LASER OPERATED WITH SATURABLE FILTER FOR Q-  
SWITCHING, NOTING TWO MODES OF EXCITATION /SOFT  
AND HARD REGIME/ A66-32314
- SATURABLE OPTICAL FILTER IN LASER AMPLIFICATION  
CHAIN USED AS ISOLATOR TO LIMIT RADIANCE  
DEPUMPING EFFECTS AD-632007 N66-30020
- PROPERTIES OF URANYL-DOPED GLASS FOR APPLICATION  
AS SATURABLE OPTICAL FILTER FOR USE WITH LASERS A67-10009
- MULTILAYER INTERFERENCE FILTER HAVING VARIOUS  
TRANSMISSION CHARACTERISTICS, EMPHASIZING FILTERS  
WITH NARROW STOP BANDS USED TO ELIMINATE LASER  
BEAM HAZARD A67-19400
- RUBY LASER MODE LOCKING AND MODE COMPETITION USING  
RG-8 FILTER AS PASSIVE MODULATOR A67-20147
- OPTICAL GENERATOR**  
NEODYMIUM-DOPED YTTRIUM-ALUMINUM GARNET CRYSTAL  
LASER OSCILLATOR AS REGENERATIVE AMPLIFIER OF  
NOISE A66-26212
- CD S SINGLE CRYSTAL OPTICAL GENERATOR DURING  
EXCITATION BY RUBY LASER, DISCUSSING TWO-PHOTON  
ABSORPTION COEFFICIENT AT 300 DEGREES K FOR  
RADIATION FLUX DENSITIES A66-27576
- GENERATION IN CADMIUM SULFIDE DURING TWO-PHOTON  
OPTICAL EXCITATION BY RUBY LASER WITH MODULATED  
Q-FACTOR A66-33134
- COHERENT LASER-TYPE LIGHT GENERATORS WITH  
CAPABILITY OF ADJUSTING FREQUENCY OVER VISIBLE  
SPECTRUM A66-36265
- CONSISTENT THEORY OF NONLINEAR OPTICAL EFFECTS IN  
BOUNDED LIGHT BEAMS BY EXTENDING PARABOLIC  
EQUATIONS TO NONLINEAR PROBLEMS A66-41095
- DESIGNS OF QUANTUM ELECTRONIC SYSTEMS - RUBY  
LASERS, QUANTUM AND OPTICAL GENERATORS, OPTICAL  
GATES, WAVEGUIDES, ELECTROMAGNETIC WAVE  
PROPAGATION, AND COMMUNICATION SYSTEMS JPRS-37132 N66-37709
- FLUX VELOCITY, CRYSTAL QUALITY AND DIAMETER,  
DISTRIBUTION OF CHROMIUM IONS, AND OTHER FACTORS  
CONSIDERED IN DESIGN OF RUBY LASER OPTICAL  
GENERATOR N66-37713
- DEVELOPMENT OF OPTICAL QUANTUM GENERATOR FROM  
HIGHLY IONIZED LOW TEMPERATURE TO CONVERT HEAT  
ENERGY INTO ELECTRIC AND COHERENT LIGHT  
RADIATION ENERGIES FOR USE IN LASER JPRS-39659 N67-18113
- OPTICAL GYROSCOPE**  
RESONANT FREQUENCY EQUATIONS FOR OPTICAL MASER  
PHOTON RATE GYROSCOPE DESIGN NASA-CR-59820 N66-33372
- OPTICAL HETERODYNE**  
F M LASER AND OPTICAL HETERODYNES IN OPTICAL  
COMMUNICATION SYSTEMS A66-26004
- LIGHT FREQUENCY MULTIPLIERS FOR NONLINEAR OPTICAL  
EFFECTS AT VARIOUS WAVELENGTHS, CONSIDERING  
FOCUSING, LASER BEAM FINITE DIVERGENCE, AIR  
BREAKDOWN, STIMULATED RAMAN EMISSION, ETC A66-26146
- LASER APPLICATION FOR VIBRATION MEASUREMENT  
UTILIZING DOPPLER SHIFT PRODUCED ON WAVE  
REFLECTED FROM SURFACE VIBRATING NORMAL TO BEAM  
PATH A66-35673
- SECOND HARMONIC FREQUENCY GENERATION OBTAINED IN  
PROCESS OF OPTICAL MIXING OF COLLINEAR NEODYMIUM  
LASER BEAMS IN POTASSIUM DIHYDROGEN PHOSPHATE

- A66-37550
- LASER DOPPLER VELOCIMETER FOR GAS AND LIQUID FLOW VELOCITY MEASUREMENT A66-42557
- OPTICAL HETERODYNE RECEIVER ANTENNA PROPERTIES, NOTING EFFECTIVE APERTURE OF CAPTURE CROSS SECTION VS DIRECTIONAL TOLERANCE AND DETECTION OF DOPPLER SHIFTS IN LIQUID SCATTERED COHERENT LIGHT A66-42809
- DEGREE OF COHERENCE OF OPTICAL BEAM TRAVERSING ATMOSPHERIC MEDIUM INCLUDING SIMULATED FOG FOR DESIGN OF OPTICAL HETERODYNE RECEIVER NASA-CR-76078 N66-29972
- CONTINUOUSLY VARIABLE OPTICAL DELAY LINE USING ACOUSTIC WAVES TO DIFFRACT AND FREQUENCY SHIFT PORTION OF ARGON ION LASER BEAM A67-12517
- OPTICAL MIXING DUE TO CONDUCTION BAND ELECTRONS IN SEMICONDUCTOR A67-12525
- OPTICAL HETERODYNE TECHNIQUE DETECTING STIMULATED BRILLOUIN SCATTERING, NOTING FREQUENCY SHIFT DEMODULATION ARISING FROM RUBY LASER LIGHT INCIDENCE ON QUARTZ CRYSTAL A67-16688
- SPATIALLY RESOLVED HE- NE LASER HETERODYNE MEASUREMENTS OF ELECTRON NUMBER DENSITIES IN WEAKLY IONIZED AR PULSED DISCHARGES A67-17272
- HIGH POWER CARBON DIOXIDE LASER HETERODYNE DETECTION OF BEATS AND LINEWIDTH MEASUREMENTS A67-17891
- OPTICAL HETERODYNE SYSTEM USED TO MEASURE ELECTRON DENSITY OF PLASMA NASA-CR-79511 N67-11738
- OPTICAL SUPERHETERODYNE RECEIVER NASA-CR-81659 N67-17982
- OPTICAL IMAGE**  
LASER ILLUMINATED ELECTRO-OPTICAL IMAGING NOTING ENERGY VARIATION PARAMETERS, EQUIPMENT USED AND RESULTS OBTAINED IN TV RECEPTION A66-35531
- LASER PHASOGRAPHY OF JETS, SHOCK WAVES, AND PLASMAS AFCL-66-299 N66-33273
- THREE-DIMENSIONAL HOLOGRAPHY NEL-1403 N67-16644
- OPTICAL INSTRUMENT**  
OPTICAL SYSTEM FOR SCHLIEREN RECORDING, DEFLECTION MAPPING, SHADOWGRAPHY AND INTERFEROMETRY ACHIEVED FOR LASER LIGHT, USED IN RECORDING OF REFRACTIVE INDEX FIELDS A66-26307
- LATERAL SHEARING INTERFEROMETER WITH GAS-LASER LIGHT SOURCE FOR TESTING LARGE OPTICAL SYSTEMS A66-27320
- MULTICOLOR LASER DISPLAY, DISCUSSING COMPONENTS AND FUTURE APPLICATION A66-35532
- DYNALENS OPTICAL ELEMENT CHARACTERIZED BY VARIABLE-GEOMETRY FLUID PRISM THAT DEFLECTS BEAM OF LIGHT OR ELECTROMAGNETIC ENERGY A67-11132
- LASERS APPLIED TO PHOTO-OPTICAL INSTRUMENTATION PROBLEMS, DETAILING SCHLIEREN SYSTEMS, INTERFEROMETRY, HIGH SPEED STREAK PHOTOGRAPHY AND TRANSSOMETER A67-12243
- NEODYMIUM-GLASS LASER USING SPONTANEOUS AMPLIFIED EMISSION IN NONRESONANT SYSTEM TO OBTAIN HIGH BRIGHTNESS OUTPUT PULSE A67-15100
- LASER MICROPROBE USED TO STUDY SMALL INCLUSIONS IN METALS A67-15461
- VIEWING SYSTEM FOR LASER OPERATING IN PRODUCTION
- SHOP A67-17792
- BIBLIOGRAPHY ON LASERS COVERING MODES, SCATTERING MECHANISMS, QUANTUM ELECTRODYNAMICS, MATTER-RADIATION INTERACTION, PLASMA, HOLOGRAPHY AND OPTICS A67-17890
- OPTICAL MASER**  
RAMAN SCATTERING STUDIES USING CONTINUOUS WAVE OPTICAL MASERS AND SPECTROMETERS MIT-DSR-4979 N66-27897
- MATHEMATICAL DEVELOPMENT OF RESONANT FREQUENCIES OF ELECTROMAGNETIC CAVITY - EVALUATION OF OPTICAL MASER PHOTON RATE GYROSCOPE NASA-CR-59809 N66-33411
- ACOUSTIC WAVE AMPLIFICATION STUDIES, OPTICAL MASER RESEARCH, OSCILLATIONS IN SEMICONDUCTORS, AND BULK INSTABILITIES IN FERROMAGNETIC MATERIALS ML-1424 N66-37453
- SEARMONT POLARISCOPE APPLIED TO ANALYSIS OF OPTICAL MASER LIGHT N67-17278
- OPTICAL MASER MODULATOR**  
RUBY LASER MODE LOCKING AND MODE COMPETITION USING RG-8 FILTER AS PASSIVE MODULATOR A67-20147
- OPTICAL MEASUREMENT**  
INTENSITY DISTRIBUTION AT FOCUS OF HIGH POWER LASER, NOTING MEASURING METHOD A66-28834
- MEASURING AMPLIFICATION OF COHERENT OPTICAL RADIATION IN NEON-HELIUM FILLED TUBE A66-33512
- LASER APPLICATION SURVEY A66-35798
- IMPLOSION OF FAST NONPREIONIZED THETA PINCH STUDIED, USING FIRST AND SECOND HARMONIC OF RUBY LASER LIGHT A66-37638
- LASER APPLICATION AS MEASURING EQUIPMENT IN METAL WORKING, DISCUSSING SURFACE-GRAZING INTERFEROMETER, FEEDBACK LASER DEVICE AND LENGTH MEASURING LASER ASME PAPER 66-MD-43 A66-38491
- MEASURING AMPLIFICATION OF COHERENT OPTICAL RADIATION IN NEON-HELIUM FILLED TUBE A66-42125
- HORIZONTAL DEFLECTION IN TV DISPLAY PRODUCED BY BRAGG REFLECTION OF LASER LIGHT BY ULTRASONIC WAVES IN WATER A66-42816
- OPTICAL SURFACE ROUGHNESS MEASUREMENT USING COHERENT RADIATION PRODUCED BY HELIUM-NEON LASER SIGMA-POLARIZED AT 6328 ANGSTROMS A67-10020
- LINE WIDTH OF CW GA- AS LASERS MEASURED USING HOMODYNE DETECTION AND AUTOCORRELATION A67-16670
- ERROR DUE TO MULTIPLE PROPAGATION IN DISTANCE MEASUREMENT BY COMPARISON OF MODULATION PHASES ON TRANSMITTED AND REFLECTED LASER BEAM A67-19606
- HOLOGRAM MEASUREMENTS OF OPTICALLY INHOMOGENEOUS FIELD BY PULSED LASER NASA-CR-82463 N67-19271
- OPTICAL METHOD**  
OPTICAL RAY TRACING TO PREDICT FOCUSING CHARACTERISTICS OF LASER LIGHT IN REFRACTIVE TARGETS, CALCULATING HEATING EFFECTS IN TARGET, NOTING TARGET GEOMETRY, REFRACTIVE INDEX, THICKNESS OF SKIN LAYERS, ETC A66-25531
- OPTICAL BEAM SCATTERING OF GAS LASER FOR MEASUREMENT OF PHOTOELASTIC CONSTANTS AND APPLICATION TO LITHIUM NIOBATE A66-28692
- COHERENT OPTICAL TRANSDUCER FOR OPTICAL INFORMATION PROCESSING A66-31244

- FAR IR RADIATION DETECTED AT VISIBLE FREQUENCY,  
USING NONLINEAR OPTICAL MIXING WITH LASERS  
A66-33322
- INTERFERENTIAL METHOD OF TESTING HIGH RESOLUTION  
PHOTOGRAPHIC EMULSIONS, USING LASER AS LIGHT  
SOURCE  
A67-10832
- OPTICAL FREQUENCY TRANSLATION OF PULSES FROM MODE  
LOCKED LASER, NOTING DOPPLER SHIFTS OF LARGE  
MAGNITUDE  
A67-12506
- OPTICAL METHODS AND EQUIPMENT USED IN CHECKING  
SURFACE FINISH AND VOLUME AND SURFACE  
INHOMOGENEITIES OF ACTIVE MEDIA AND  
INTERFEROMETRIC MIRRORS OF LASERS  
A67-13143
- LASER APPLICATION TO RADAR SIGNAL PROCESSING AND  
COMMUNICATIONS EQUIPMENT  
A67-15303
- CLEAR AIR TURBULENCE DETECTION WITH LASER RADAR,  
NOTING AIRBORNE EQUIPMENT AND RESULTS  
A67-15304
- LASER DIGITAL DEVICES, DISCUSSING USE AS SWITCHING  
CIRCUIT IN DIGITAL COMPUTER  
A67-19088
- MICROSCOPIC HOLE DRILLING INTO METALS BY LASER  
BEAMS, NOTING ENERGY AND POWER CORRELATION WITH  
HOLE MAGNITUDE  
A67-19090
- STEADY STATE LASER DESIGN, COMPARING BALANCE  
METHOD WITH METHOD BASED ON QUASI-CLASSICAL THEORY  
A67-20245
- OPTICAL MODULATION**
- AUTOMODULATION OF EMISSION FROM SOLID STATE LASER  
A66-26041
- FAST-ACTING FLUID SEAL FOR Q-FACTOR MODULATION OF  
NEODYMIUM GLASS LASER  
A66-27595
- Q-FACTOR MODULATION OF RUBY-LASER RESONATOR BY  
PHthalOCYANINE SERIES  
A66-29353
- LASER Q-FACTOR MODULATION BY SPECTRAL ABSORPTION  
FILTERS WITH INVERSE BLEACHING  
A66-29354
- SPECTRAL COMPOSITION OF LASER LIGHT WITHIN  
FRAMEWORK OF THEORY OF NONLINEAR OPTICAL EFFECTS  
A66-29356
- SMALL SIGNAL MODULATION EFFECT ON PHOTOELECTRON  
COUNTING OF HE- NE LASER INTENSITY FLUCTUATIONS  
A66-31097
- GIANT COHERENT LIGHT PULSE GENERATION BY Q-  
FACTOR-MODULATED LASER  
A66-31183
- INTERNAL PHASE MODULATION IN HE- NE LASER USING  
ELECTRO-OPTIC EFFECT IN CRYSTAL QUARTZ, OBSERVING  
SPECTRUM AND RF MODE BEATS  
A66-32621
- OPTICAL MODULATION IN BULK GALLIUM ARSENIDE, USING  
GUNN EFFECT  
A66-33606
- SELF-MODULATION OF LASER WITH TWO-MODE RESONATOR  
A66-35372
- Q MODULATION OF LASER THEORY AND APPLICATION,  
PRESENTING GIANT PULSE PRODUCTION,  
PHENOMENOLOGICAL THEORY, OUTPUT RESPONSE TO STEP  
FUNCTION CHANGE, ELECTRO-OPTIC AND MECHANICAL  
MODULATORS  
A66-36971
- Q-FACTOR MODULATION OF RUBY-LASER RESONATOR BY  
PHthalOCYANINE SERIES  
A66-37358
- SPECTRAL COMPOSITION OF LASER LIGHT WITHIN  
FRAMEWORK OF THEORY OF NONLINEAR OPTICAL EFFECTS  
A66-37360
- LASER MODE-LOCKING DURING RESONATOR Q-FACTOR  
MODULATION  
A66-39303
- FAST-ACTING FLUID SEAL FOR Q-FACTOR MODULATION OF  
NEODYMIUM GLASS LASER  
A66-42729
- LASER MODE CONTROL AND STABILIZATION USING  
INTERNAL TIME-VARYING PERTURBATION  
A66-42813
- OPTICAL MODULATOR FOR SATELLITE TO GROUND OR  
GROUND TO GROUND LASER COMMUNICATION LINK  
NASA-TN-X-55539  
N66-30362
- OPTICAL MODULATOR USING ELECTRO-OPTIC EFFECT IN  
LITHIUM TANTALATE FOR PCM TRANSMISSION SYSTEMS  
OPERATING AT 224 MEGACYCLE BIT RATE  
A67-10013
- MICROWAVE MODULATION OF HELIUM-NEON LASER  
INTENSITY STUDIED AS FUNCTION OF TEMPERATURE AND  
ELECTRON DENSITY  
A67-10260
- GIANT COHERENT LIGHT PULSE GENERATION BY Q-FACTOR  
MODULATED LASER  
A67-10261
- SELF-MODULATION CHARACTERISTICS OF CARBON DIOXIDE  
LASER AND USE IN MEASURING DETECTOR RESPONSE AND  
ATMOSPHERIC PROPAGATION CHARACTERISTICS  
A67-14399
- SINGLE MODE OUTPUT POWER MODULATION ANALYSIS OF  
SATURATION AND GAIN OF GAS LASERS AND EFFECTS OF  
EXCITATION DENSITY MODULATION AND RESONATOR Q  
MODULATION  
A67-15111
- MAGNETO-OPTICAL MODULATION OF IR EMISSION OF  
HE- NE GAS LASER  
A67-15139
- INTRACAVITY TIME-VARYING PERTURBATION OF LOSSES IN  
GAS LASER USING DIAMAGNETIC FARADAY EFFECT IN  
GLASSES ANALYZED IN CONNECTION WITH OUTPUT  
INTENSITY  
A67-16646
- EQUATION FOR DYNAMICAL BEHAVIOR OF LASER, SOLVING  
CASE OF DEEP MODULATION OF OUTPUT, NOTING  
PULSATION PROBLEMS  
A67-16662
- SINGLE MODE OUTPUT POWER MODULATION STUDY OF  
SATURATION AND GAIN OF GAS LASER  
A67-16686
- INTERNAL MODULATION OF IR GAS LASER USING  
CADMIUM SULFIDE OR SELENIDE SINGLE CRYSTALS  
A67-16914
- PERIODIC AUTOMODULATION OF RADIATION AND  
POSSIBILITY OF GENERATING GIANT PULSES IN THREE-  
LEVEL LASER WITH INHOMOGENEOUSLY EXCITED ACTIVE  
MEDIUM  
A67-17233
- SEMICONDUCTOR MIRROR FOR Q-FACTOR MODULATION OF  
LASER RESONATOR  
A67-18789
- RATE EQUATIONS FOR GAS DISCHARGE MODULATION OF  
HE- NE LASER  
A67-19492
- ERROR DUE TO MULTIPLE PROPAGATION IN DISTANCE  
MEASUREMENT BY COMPARISON OF MODULATION PHASES ON  
TRANSMITTED AND REFLECTED LASER BEAM  
A67-19606
- PHOTON COUNTING DISTRIBUTIONS AND INTENSITY  
FLUCTUATIONS OF MODULATED LASER BEAMS  
A67-20125
- LOW POWER WIDE BANDWIDTH LASER MODULATORS  
N67-13069
- OPTICAL PATH**
- THERMALLY-INDUCED OPTICAL PATH DISTORTIONS IN  
LASER RODS MEASURED BY OBTAINING TIME RESOLVED  
INTERFEROGRAMS, USING MACH-ZEHNDER  
INTERFEROMETER AND Q-SWITCHED LASER  
A66-25994
- EFFECTS AND PARAMETERS INFLUENCING OPTICAL PATH  
LENGTH WITHIN PUMPING PROCESS IN RUBY AND DOPED  
GLASS LASER RODS  
A66-31443
- AMPLITUDE AND FREQUENCY MEASUREMENT OF RANDOM  
POSITION FLUCTUATION OF STATIONARY LASER OPTICAL  
SOURCE DUE TO ATMOSPHERIC TURBULENCE  
NASA-TN-D-3439  
N66-25558

- DYNAMIC OPTICAL PATH DISTORTION IN RUBY AND NEODYMIUM DOPED GLASS LASER RODS DUE TO EVOLUTION OF THERMAL GRADIENTS DURING OPTICAL PUMPING CYCLE N66-28554
- ANALYSIS AND STEADY STATE SOLUTION FOR USING ONE RUBY LASER ROD TO PUMP ANOTHER, IN ORDER TO REDUCE OPTICAL PATH DISTORTIONS N66-28555
- OPTICAL PATHS AND VARIABLE-CONTRAST INTERFERENCE AT MICHELSON INTERFEROMETER WHICH ADDS TWO GROUPS OF TWO LASER COHERENT WAVES A67-17636
- INTERFEROMETRIC PHOTOGRAPHIC TECHNIQUES FOR RECORDING OPTICAL PATH LENGTH VARIATIONS IN PUMPED LASER RODS ECOM-2751 N67-14331
- OPTICAL POLARIZATION**
- LAMB SELF-CONSISTENT THEORY AND RATE EQUATION APPROXIMATION STUDY OF MAGNETIC DEPOLARIZATION OF VAPOR AND POLARIZATION OF MONOMODE GAS LASER IN MAGNETIC FIELD A67-16644
- OPTICAL PROPERTY**
- THERMAL OPTICAL BEHAVIOR OF GLASSES AND OTHER POTENTIAL LASER MATERIALS AND THERMAL DISTORTION IN AIR, WATER, BENZINE, ETHANOL AND TOLUENE A66-25996
- OPTICAL COHERENCE FUNCTIONS AND PROPERTIES FROM STATISTICAL VIEWPOINT FOR APPLICATION TO SPECTROSCOPY AND STELLAR INTERFEROMETRY A66-31987
- RADIATION NOISE EFFECT ON LASER OPTICAL PROPERTIES, NOTING DENSITY VS RESONATOR CHARACTERISTICS, ENERGY SPECTRUM, ETC A66-40917
- OPTICAL TRANSMISSION OF PLASMA COLUMN GENERATED BY IONIZED GAS EXPLOSION DETERMINED, USING LASER BEAM A66-42998
- LASER BEAM DETERIORATION AND STIMULATED RAMAN EFFECT AD-628074 N66-24738
- DYNAMIC OPTICAL PROPERTIES OF LASER MATERIALS P66-134 N66-35125
- OPTICAL PHENOMENA IN LIQUID AND GASEOUS MEDIA AD-626808 N66-35526
- NONLINEAR OPTICAL MATERIALS PROPERTIES DISCUSSED ON BASIS OF SOVIET AND FOREIGN STUDIES INVOLVING LASERS A67-11011
- OPTICAL PUMPING**
- DEPOPULATION OF GROUND STATE CHROMIUM IONS IN RUBY UNDER OPTICAL PUMPING EXPLAINED VIA RATE EQUATIONS A66-25188
- LASER PUMPING BY INTENSE NOBLE GAS DISCHARGE IN ZETA-PINCH GEOMETRY A66-25995
- SPECTROSCOPY OF LITHIUM FLUORIDE CRYSTALS ACTIVATED WITH URANIUM TRIOXIDE FOR LASER ACTION, SHOWING ANOMALOUS FLUORESCENT DECAY UNDER HIGH INTENSITY PUMPING A66-25997
- OPTICAL LENGTH VARIATIONS IN LASER AMPLIFIERS DETERMINED DURING PUMPING AND AMPLIFICATION, USING INTERFEROMETRY A66-25999
- MONTE CARLO TECHNIQUE TO DETERMINE TOTAL ENERGY AND ENERGY DISTRIBUTION IN LASER CRYSTAL DUE TO OPTICAL PUMPING A66-26028
- EFFECT OF FLUCTUATING LASER PUMP ON STIMULATED RAMAN SCATTERING, NOTING GROWTH OF COUPLED STOKES-ANTI-STOKES WAVES IN PRESENCE OF TWO-MODE PUMP A66-26158
- NONLINEAR QUANTUM EFFECT IN SOLID STATE LASERS USING PARAMAGNETIC CRYSTALS, NOTING RAMAN EFFECT AND GAIN DEPENDENCE ON PUMPING POWER A66-26172
- ABSORPTION BEHAVIOR OF OPTICALLY PUMPED RUBY ROD, NOTING AMPLIFICATION AT ROOM TEMPERATURE AND ABSORPTION AT CRYOGENIC TEMPERATURE A66-26174
- Q-SWITCHED LASERS, INTERACTION OF HIGH POWER LIGHT PULSE WITH MATTER AND SEMICONDUCTOR LASERS PUMPED WITH OPTICAL RADIATION AND ELECTRON BEAMS INVESTIGATED, USING QUANTUM OSCILLATOR AND AMPLIFIER A66-26180
- EXCITATION IN ELECTRON BEAM PUMPED / EBP/ GA AS LASERS INCLUDING ELECTRON SCATTERING, ENERGY DISSIPATION PATTERN, PHONON EMISSION, PAIR PRODUCTION, ETC A66-26181
- PHOTOLUMINESCENCE AND STIMULATED EMISSION OF GALLIUM ARSENIDE AND INDIUM ANTIMONIDE OBTAINED BY OPTICAL PUMPING, NOTING EFFECT OF APPLIED MAGNETIC FIELD ON LASER AND DIODE EMISSIONS A66-26182
- SELF-PUMPING CHEMICAL LASER THEORY AND OPERATION, NOTING CHEMICAL PUMPING A66-26382
- PUMPING NEODYMIUM LASERS THROUGH USE OF COHERENT EMISSION OF RUBY LASERS, FINDING THRESHOLD ENERGY A66-27605
- AXIAL AND TRANSVERSE MODE SELECTION, EMISSION SPECTRUM AND TRANSIENT EMISSION BEHAVIOR OF CONFOCAL RUBY LASER OPERATED IN ELLIPSOIDAL PUMPING SYSTEM A66-27606
- SOLAR PUMPING AND MODULATION OF VARIOUS LASER MATERIALS FOR DEEP SPACE COMMUNICATION, NOTING TV PICTURE TRANSMISSION A66-28971
- RESONATOR TRANSIENTS USED TO SHORTEN GIANT LIGHT PULSES GENERATED IN Q-SWITCHED LASER OSCILLATORS TO PUMP SECONDARY LASER OSCILLATOR WITH SUITABLE ABSORPTION BAND A66-31077
- NONUNIFORM PUMPING EFFECTS ON NEAR-AXIAL LOW-ORDER TRANSVERSE MODE STRUCTURE IN SOLID STATE LASER CAVITY A66-31087
- BEAM DIVERGENCE AND FAR FIELD PATTERNS IN RUBY LASERS A66-31098
- EFFECTS AND PARAMETERS INFLUENCING OPTICAL PATH LENGTH WITHIN PUMPING PROCESS IN RUBY AND DOPED GLASS LASER RODS A66-31443
- SUN PUMPED CONTINUOUS WAVE ONE-WATT YAG CRYSTAL LASER, NOTING EQUIPMENT SETUP AND OUTPUT DURATION A66-32620
- SOLID STATE CW OPTICALLY PUMPED MICROWAVE MASER, USING DIVALENT THULIUM DOPED CALCIUM FLUORIDE A66-33614
- LASER REGIME WITH GIANT PULSES GENERATED IN DYSPROSIUM DOPED CADMIUM FLUORIDE UNDER CONTINUOUS PUMPING BY XENON LAMPS, OBTAINING Q FACTOR MODULATION BY ROTATING PRISM A66-34178
- DECAY CROSS SECTION OF PUMPED METASTABLE HE ATOMS IN HE- NE LASER A66-34695
- RADIATION FROM HIGH-ENERGY-LEVEL TRANSITIONS EXCITED IN HE- NE LASER DURING OPTICAL PUMPING WITH HE LAMP A66-34697
- TRANSFER EFFICIENCY OF LASER PUMPING CAVITIES WITH DIFFUSELY REFLECTING WALL DETERMINED, BASED ON APPROXIMATELY ISOTROPIC NATURE OF LIGHT INSIDE CAVITY A66-35379
- LIGHT ENERGY MEASUREMENTS MADE WITH ARGON BOMB USED AS CHEMICALLY POWERED LASER PUMP A66-35388
- PUMPING ENERGY DISTRIBUTION OF RUBY LASER, DISCUSSING EXISTENCE OF TRAPPED MODES AND EFFECT OF PARTIALLY FILLED WATER JACKET SURROUNDING RUBY RODS A66-35389
- PULSED RUBY LASERS, CONSIDERING PUMPING AND

- THRESHOLD, OUTPUT, QUANTUM MECHANICS AND VARIATION ON BASIC DEVICE A66-36968
- FLUORESCENCE OF RARE EARTH, ACTINIDE AND TRANSITION METAL IONS IN INSULATING CRYSTALS AS RESULT OF OPTICAL EXCITATION, DISCUSSING SPECTROSCOPIC PROPERTIES AND OPERATING CHARACTERISTICS A66-36969
- PULSED OPERATION OF ELECTRON-BEAM PUMPED ZINC OXIDE LASER EMITTING RADIATION IN UV AT VERY LOW TEMPERATURES, NOTING IMPORTANCE OF USE OF CAVITY A66-37768
- PHOTODISSOCIATION LASER SYSTEM, DISCUSSING OUTPUT ENERGY DEPENDENCE ON PRESSURE, TEMPERATURE AND NUMBER OF SUCCESSIVE OPTICAL PUMPING FLASHES A66-37781
- STIMULATED EMISSION SPECTRUM IN AXIAL-MODE MODEL OF PLANE RESONATOR IN STATIONARY GENERATION REGIME A66-38127
- PULSED-MODE GAIN CHARACTERISTICS IN NEODYMIUM-DOPED SILICATE GLASS LASER EXPERIMENTALLY RELATED TO GIANT-PULSE LASER ENERGY OUTPUT A66-38396
- GENERAL NONEQUILIBRIUM SYSTEM IN CONTACT WITH RESERVOIR DESCRIBED VIA CORRELATION FUNCTIONS OF QUANTIZED FIELD OPERATORS, NOTING INFLUENCE OF CAVITY AND OPTICAL PUMP A66-38633
- COUPLING OF ADJACENT AXIAL MODES IN EXTERNAL RAMAN RESONATOR OBSERVED AS FIRST STOKES FREQUENCY WITH BENZENE AS RAMAN MEDIUM AND Q-SWITCHED RUBY LASER AS PUMP SOURCE A66-39109
- EXPERIMENTAL EXCITED STATE BAND LOCATIONS AND INTENSITIES IN ABSORPTION SPECTRUM OF ELECTRON TRANSITIONS IN OPTICALLY PUMPED RUBY LASER A66-39569
- RUBY LASER PUMPING SYSTEM AND LOW COST MERCURY FLASH TUBE WITH HIGH REPETITION RATES USED FOR MICROMACHINING PROCESS A66-40336
- COMPACT DISCHARGE LAMP DESIGNED FOR CONTINUOUS PUMPING OF SOLID STATE LASER, WITH INTEGRAL MOUNTS FOR CRYSTALS AND ENCLOSURE PROVIDING COOLING CIRCUITS FOR LAMP AND CRYSTAL A66-41247
- MASTER EQUATION SOLVED TO OBTAIN DIAGONAL ELEMENTS OF DENSITY MATRIX FOR LASER LIGHT, TAKING INTO ACCOUNT PUMPING SCHEME CHARACTERIZING THREE-LEVEL LASER A66-41374
- SPONTANEOUS EMISSION IN INVERSELY POPULATED MEDIUM EXAMINED FOR UNIFORM RUBY ROD LASER WITH UNIFORM PUMPING DISTRIBUTION A66-41450
- STIMULATED EMISSION OF POLYMETHINE DYES UPON PUMPING WITH Q-SWITCHED LASER, NOTING WAVELENGTH PARAMETERS AND OSCILLATION A66-42247
- CONDUCTIVITY MODULATION BY HEAVY-TO-LIGHT HOLE TRANSITIONS IN P-TYPE GERMANIUM NOTING CARRIER LIFETIME AND RINGING OF LASER PULSE A66-42249
- ABSORBER CONCENTRATION EFFECT ON PULSED LASER SYSTEM NOTING PERFORMANCE CHARACTERISTICS, THRESHOLD ENERGY, PUMPING DYNAMICS AND TIME PARAMETERS A66-42254
- BOOK ON LASERS COVERING OPTICAL CAVITIES, GAS LASERS, SOLID STATE LASERS, OPTICAL PUMPING, Q-SWITCHING, POPULATION INVERSION, ETC A66-42319
- MODE SELECTION, RELAXATION OSCILLATIONS, MODE INTERACTION AND THERMAL EFFECTS IN ROOM TEMPERATURE CW LASERS IN ELLIPSOIDAL PUMPING SYSTEMS A66-42546
- GLASS LASERS, COMPARING GLASS WITH CRYSTALS AS HOSTS FOR LASER IONS, CONSIDERING NEODYMIUM LASER PROPERTIES A66-42800
- SEMICONDUCTOR LASER TECHNOLOGY, OPERATING PRINCIPLES, MATERIAL PROPERTIES AND PERFORMANCE, WITH EMPHASIS ON GaAs JUNCTION LASERS A66-42802
- MASER AMPLIFIER BASED ON UV CONTINUUM PUMPING FROM NEARBY STARS, EXPLAINING 18-CM OH EMISSION FROM ANOMALOUS H-2 REGIONS A66-43042
- ULTRAVIOLET RADIATION FOR RUBY LASER PUMPING, AND ENERGY TRANSFER PROCESSES BETWEEN ELECTRON ORBITS AND BETWEEN UNLIKE IONS ML-1393 N66-24104
- OPTICAL AND ELECTRON INTERACTIONS WITH METASTABLES - AFTERGLOW PLASMA IONIZATION PROCESS REPT.-24 N66-26512
- PULSED ARC XENON DISCHARGES USED FOR OPTICAL PUMPING OF HIGH ENERGY LASERS AD-632892 N66-31537
- CESIUM VAPOR USED FOR TRANSFORMER LASER TO BE OPTICALLY PUMPED BY BATTERY OF NEODYMIUM LASERS GPL-A-31-3 N66-33813
- DISTRIBUTION OF PUMPING RADIATION DENSITY IN TRIHEDRAL PRISM LASER RESONATOR BY GEOMETRICAL OPTICS TG-230-T476 N66-34774
- DOUBLE PULSE PUMPING OF RUBY LASERS FOR IMPROVEMENT OF LASER PERFORMANCE AND EFFICIENCY SA-TR20-9301 N66-35622
- OPTICAL PUMPING, THEORY, AND LABORATORY RESEARCH WITH RUBIDIUM MASER OSCILLATORS NASA-CR-77924 N66-36387
- FORMULAS FOR ANALYZING CHARACTERISTICS OF SINGLE-PULSE Q-SWITCHING LASER AS FUNCTION OF POPULATION INVERSION, PUMPING POWER, MIRROR REFLECTIVITY, AND PROPERTIES OF MEDIUM TG-230-T473 N66-37256
- FEASIBILITY OF USING FLUORESCING DYES PUMPED WITH RUBY LASER FOR LOWER THRESHOLDS THAN RAMAN TYPE LASERS AD-636953 N66-38187
- C W LASER USING 3-INCH RUBY CRYSTALS WITH 15 PERCENT MIRROR TRANSMISSION, PUMPING POWER OF DOUBLE THRESHOLD VALUE AND 1.6 WATT POWER OUTPUT A67-10244
- APPROXIMATE ABSOLUTE VALUES OF PUMPING POWER, THRESHOLD POWER AND CRITICAL EXCESS POPULATION FOR RUBY LASER DETERMINED FROM RELATIVE FLASH TUBE INTENSITY MEASUREMENTS A67-10245
- LASER ACTION IN OPTICALLY PUMPED CN, DISCUSSING VIBRATIONAL-ROTATIONAL TRANSITIONS A67-10370
- FLASHLIGHT /INCOHERENT/ PUMPING OF VISIBLE AND IR, IN SB AND CD S- CD SE LASERS A67-10447
- DECAY CROSS SECTION OF PUMPED METASTABLE HE ATOMS IN HE NE LASER A67-10511
- RADIATION FROM HIGH ENERGY LEVEL TRANSITIONS EXCITED IN HE- NE LASER DURING OPTICAL PUMPING WITH HE LAMP A67-10513
- OPTICAL PUMPING WITH DIODE LASER INTO FABRY-PEROT RESONATOR FACE OF THIN HIGHLY-ABSORBING SEMICONDUCTOR, NOTING VARIABLE MODE SPACING INCLUDING SINGLE MODE OUTPUT A67-10879
- LASER CHARACTERISTICS OF NARROW BAND TYPE I SOLAR RADIO BURST AND MAGNETIC DIPOLE TRANSITIONS IN SPLIT ZEEMAN SUBLEVELS OF HYDROGEN ATOMS OF SOLAR CORONA IN GROUND LEVEL A67-11652
- Q-SPOILING OF RUBY LASER BY OPTICAL PUMPING IN INTENSE INHOMOGENEOUS MAGNETIC FIELD WITH REDUCED GAIN A67-12505



PUMPING OF ORGANIC DYES IN ORGANIC SOLVENTS, USING PULSED RUBY LASER A67-12515

VOLUME DENSITY OF HEAT SOURCES IN RUBY LASER ROD BY NUMERICAL INTEGRATION OF PUMPING AND ABSORPTION SPECTRA A67-13117

KINETIC EQUATION DERIVATION FROM DENSITY MATRIX FOR CASE OF QUANTUM GENERATION OF SECONDARY OPTICAL HARMONIC IN LASER CAVITY UNDER VARIOUS OPTICAL PUMPING CONDITIONS A67-13127

PARAMETRIC AMPLIFICATION OF FAR IR IN TE CRYSTAL PUMPED BY CARBON DIOXIDE LASER A67-13572

SPONTANEOUS EMISSION IN INVERSELY POPULATED MEDIUM EXAMINED FOR UNIFORM RUBY ROD LASER WITH UNIFORM PUMPING DISTRIBUTION A67-14186

EMISSION FROM TELLURIUM SINGLE CRYSTAL PUMPED BY TWO WAVES FROM CARBON DIOXIDE LASER A67-14914

TRIVALENT NEODYMIUM DOPED GLASS LASER WITH INTERNAL IMPERFECTIONS DUE TO OPTICAL PUMPING EXAMINED VIA OPTICAL METALLOGRAPHY, TRANSMISSION ELECTRON MICROSCOPY AND ELECTRON DIFFRACTION TECHNIQUES A67-14927

FRACTION OF LUMINOUS ENERGY CAPTURED BY OPTICAL PUMPING LASERS IN GIVEN GEOMETRICAL CONFIGURATION, OBTAINING FUNCTIONING THRESHOLD DEPENDING ONLY ON CRYSTAL A67-15498

ABRUPT TRANSMISSION CHANGE DURING RUBY LASER EMISSION RESULTING FROM PUMPING WITH XENON FLASH LAMP A67-15649

FISSION OR RADIOISOTOPIC NUCLEAR RADIATION APPLIED TO LASER PUMPING, DISCUSSING FORMS, SOURCES, POWER, SOLID STATE AND MOLECULAR GAS LASERS, ENERGY TRANSFER, OPTICAL FLUORESCENCE AND CUT-OFF PHENOMENON A67-16547

LOSS MEASUREMENT FOR RUBY LASER RESONANT CAVITY, COMPARING THRESHOLDS FOR R SUB 1 AND R SUB 2 LINE OPERATION A67-16655

OPTICALLY PUMPED RUBY NOTING ABSORPTION AND EMISSION SPECTRUM, TRANSITION STAGES AND PHONON TERMINATED AMPLIFICATION A67-16658

TUNABLE RAMAN LASER OBTAINED BY ELECTRON MOBILITY SUBJECTED TO MAGNETIC FIELD, NOTING THRESHOLD PUMP POWER A67-16684

THRESHOLD OF PARAMETRIC OSCILLATOR SYSTEM WITH IDLER MODES IN SAME FREQUENCY SPACING AS LASER PUMP SOURCE A67-16823

GASEOUS LASER OUTPUT EXPRESSED IN SINGLE OR TWO-LINE OSCILLATIONS AS FUNCTION OF PUMPING RATES AND TRANSITION PROBABILITIES, CONSIDERING CONCEPT OF EQUIVALENT NETWORK A67-16979

PUMPING MEDIUM POWER LASERS USING ARTIFICIAL METEORS TO PRODUCE INTENSE GAS GLOW IN COMPRESSION WAVE A67-17757

EXTENSION OF PAPER ON SATURABLE ABSORBER GIANT PULSE LASERS TO INCLUDE EFFECTS OF FINITE ABSORBER LIFETIME ON PULSE PARAMETERS, NOTING PUMP ROLE A67-18148

GAS LASER BEHAVIOR IN MAGNETIC FIELD, ANALYZING DATA ON MAGNETIC EFFECT, ZEEMAN EFFECT AND MICROWAVE PUMPING A67-18168

SEMICONDUCTOR LASERS USING SINGLE AND DOUBLE PHOTON OPTICAL EXCITATION A67-18930

Y AG SOLID STATE LASER SYSTEM, DISCUSSING OUTPUT, THEORETICAL LIMITS, PERFORMANCE CHARACTERISTICS, ETC A67-19084

BOOK ON LASERS, LIGHT AMPLIFIERS AND OSCILLATORS NOTING OPTICAL RESONATORS, OPTICAL PUMPING, PULSED LASERS, ETC A67-19469

OPTIMAL DESIGN OF ELLIPTICAL PUMPING CHAMBERS FROM NUMERICAL CALCULATIONS CONTAINING ALL GEOMETRIC SIZES OF PUMPING LAMPS AND LASER RODS AND REFLECTIVITY OF WALLS A67-19490

# OPTICAL RADAR

OPTICAL INSTRUMENTATION RADAR FOR REAL-TIME POSITIONAL DATA ON HIGH-SPEED COOPERATIVE TARGETS A66-25654

LIGHT DETECTION AND RANGING / LIDAR/ TECHNIQUE USE IN ATMOSPHERIC RESEARCH, PARTICULARLY METEOROLOGICAL FACTORS IMPORTANT TO AVIATION AND ROCKET OPERATIONS A66-27892  
AIAA PAPER 65-464

MEASUREMENT OF DISTANCE TO MOON BY OPTICAL RADAR, DISCUSSING RUBY LASER/PHOTOMULTIPLIER APPARATUS AND PROCEDURE A66-30291

LASER RADAR RANGING SYSTEM USING PSEUDORANDOM CODE MODULATION, CONSIDERING APPLICATION TO PULSE AND DIGITAL CIRCUITRY, STATISTICAL COMMUNICATION THEORY AND ELECTRO-OPTICAL ENGINEERING A66-33557

LASER TECHNOLOGY AND APPLICATION ESPECIALLY IN OPTICAL RADAR AND SPACE TRACKING ON EXPLORER SATELLITES N66-31850  
NASA FACTS, VOL. III, NO. 6

RANGE MEASUREMENTS OF GEOS-I AND BE-C SATELLITES WITH RUBY LASER N66-34634  
NASA-CR-77292

GIANT PULSE LASER WITH HIGH REPETITION RATE FOR OPTICAL RANGING SYSTEMS N66-36248  
NSF-P-9

OUTPUT CHARACTERISTICS OF HALF-WAVE MODE KERR CELL RUBY OSCILLATOR USED AS OPTICAL RADAR FOR CLEAR AIR TURBULENCE / CAT/ DETECTION A67-12053

GA AS ROOM TEMPERATURE LASER DIODE APPLICATION TO COMMUNICATION AND RADAR SYSTEMS A67-19086

MEASUREMENT AND THEORY, INCLUDING SIGNAL TO NOISE AND TRANSFER FUNCTION CALCULATIONS, OF ATMOSPHERIC WATER VAPOR USING RUBY LASER OPTICAL RADAR N67-13488

RESEARCH REPORTS ON PHYSICS OF LASER RADIATION, OPTICAL RADAR SYSTEMS, CORNER REFLECTOR ON LUNAR SURFACE, PHOTON CORRELATIONS AND COUNTING STATISTICS, AND COLD CATHODES FOR GAS LASERS N67-16014  
NASA-CR-81248

# OPTICAL RANGEFINDER

DESCRIPTION OF RUBY LASER USED IN OPTICAL LOCATION OF MOON N66-29428  
NASA-TT-F-8866

PULSED RUBIDIUM LASER RANGE MEASUREMENTS WITH DELAYED SWEEP OSCILLOSCOPE, AND WITH DIGITAL READOUT SYSTEM N66-32075

# OPTICAL REFLECTIVITY

CAVITY LOSS AND OPTIMUM REFLECTIVITY OF OUTPUT MIRROR IN RUBY LASER WITH EXTERNAL MIRROR A66-25187

PHOTON ECHO, OPTICAL ANALOG OF SPIN ECHO, IN RUBY CRYSTALS, USING RUBY LASER AS EXCITATION SOURCE A66-26170

PLASMA RESONANCE AND SCATTERING, THRESHOLD VARIATION AND OPTICAL REFLECTIVITY IN PULSED LASER BEAM-INDUCED GAS BREAKDOWN A66-26192

LUNAR FIGURE AND ORBIT PARAMETERS MEASURED BY OPTICAL LOCATION METHOD A66-35285

Q-SWITCHED LASER OPERATION OBSERVED USING LIQUID SELENIUM MIRROR AS REFLECTOR IN RUBY LASER MEASURING REFLECTIVITY CHANGES A67-16679

## OPTICAL RESONANCE

RUBY LASER WITH NONRESONANT FEEDBACK DUE TO RADIATION SCATTERING, SHOWING USE AS OPTICAL FREQUENCY STANDARD A67-16642

## OPTICAL RESONATOR

OPTICAL RESONATOR DIFFRACTION LOSS, NOTING LASER OSCILLATIONS IN HIGH LOSS ARRANGEMENTS, OUTPUT BEAM POWER, FIELD PATTERNS, ETC A66-25195

LASER PRODUCING TWO OR THREE LIGHT PULSES IN SEQUENCE WITH INTERVAL BETWEEN PULSES MECHANICALLY CONTROLLED BY OPTICAL WEDGE INSERTED INTO RESONATOR A66-25322

RUBY LASER EXPERIMENT YIELDING GIANT PULSES BY SEPARATING MIRRORS FROM CRYSTALS A66-25684

ELLIPTIC CAVITY DESIGN FOR SOLID STATE LASERS, DISCUSSING MULTIPLE REFLECTIONS, ABSORPTION COEFFICIENT, REFRACTION LOSSES, ETC A66-25998

MICROWAVE MODELS OF OPTICAL RESONATORS, DISCUSSING CORRECTION OF DISCREPANCIES RESULTING FROM APPROXIMATIONS IN MEASUREMENTS A66-26006

NATURAL MODES OF PLANE AND CYLINDRICAL DIELECTRIC RESONATORS IN OPTICAL BAND A66-26042

HELIUM-NEON LASER MULTIBEAM GENERATION IN GAS DISCHARGE TUBE, USING SPHERICAL MIRRORS AND TAPERED PLATES A66-26053

INTERACTION BETWEEN STIMULATED BRILLOUIN AND RAMAN SCATTERING IN CARBON SULFIDE, USING OPTICAL RESONATOR AND LASER BEAM A66-26162

DUST PARTICLES IN LASER CAVITY OBSERVED FOR ANGULAR STABILIZATION AND CONSTANT VELOCITIES A66-26594

L F FLUCTUATIONS IN EMISSION OF HE- NE GAS LASER MEASURED, USING FABRY- PEROT RESONATOR AND RING-TYPE RESONATOR A66-27186

OSCILLATION TYPES FOR GAS-LASER SEMICONCENTRIC RESONATOR A66-28160

OPEN LASER RESONATOR COMPOSED OF TWO IDEALLY SPHERICAL MIRRORS WITH RECTANGULAR APERTURE A66-29200

RESONATOR GEOMETRY AND MIRROR POSITIONS AND EFFECT ON RADIATION OUTPUT IN HELIUM-NEON LASER A66-29201

OPTICAL RESONATOR USING CYLINDRICAL MIRROR WITH VARIABLE RADIUS OF CURVATURE A66-29703

MULTIPLEX LIGHT FILTER FOR EXCITATION OF RUBY LASER A66-30853

NONUNIFORM PUMPING EFFECTS ON NEAR-AXIAL LOW-ORDER TRANSVERSE MODE STRUCTURE IN SOLID STATE LASER CAVITY A66-31087

MODES OF TILT-MIRROR OPTICAL RESONATOR, USING SPILLOVER RADIATION TO EXTRACT COHERENT FAR IR A66-31134

TRUNCATED EQUATIONS DESCRIBING COHERENT RADIATION OF EXCITED CHROMIUM IONS IN RUBY SITUATED IN TRAVELING WAVE RESONATOR A66-31547

LASER MODE OPERATION IN PRESSURE OF RADIATION ABSORBING IMPURITY ANALYZED BY EXTENDED THOMSON TYPE SYSTEM A66-31558

OBTAINING HIGHLY MONOCHROMATIC RADIATION ON SINGLE WAVE FROM RUBY LASER A66-31809

STEADY STATE OSCILLATIONS OF MOLECULAR BEAM LASER WITH INHOMOGENEOUS SINUSOIDAL FIELD IN RESONATOR A66-32243

LARGE WAVELENGTH CHANGES IN GALLIUM ARSENIDE

INJECTION LASERS DUE TO CHANGES IN CAVITY Q A66-32635

OPEN LASER RESONATOR COMPOSED OF TWO IDEALLY SPHERICAL MIRRORS WITH RECTANGULAR APERTURE A66-33049

RESONATOR GEOMETRY AND MIRROR POSITIONS AND EFFECT ON RADIATION OUTPUT IN HELIUM-NEON LASER A66-33050

TWO-LASER CAVITY IN TANDEM TO RESOLVE COMPONENTS WITH HOMOGENEOUSLY BROADENED / DOPPLER/ LINE A66-36720

MODE THEORY OF SPHERICAL MIRROR RESONATORS, DISCUSSING DIFFRACTION LOSSES, RESONANT CONDITIONS, MODE PATTERNS, INTERNAL FOCUSING ELEMENTS, MODE SELECTION, ETC A66-36972

POLARIZATION OF PULSED RADIATION FROM GA AS LASER DIODE TO DETERMINE ORIGIN OF NATURAL OSCILLATIONS OF RESONATOR A66-37549

PHASE RELATIONS OF LONGITUDINAL MODES IN GAS LASER WITH ANNULAR RESONATOR A66-37663

CONFOCAL RESONATOR THEORY INSTEAD OF DIFFRACTION AS EXPLANATION OF 90 DEGREE ROTATION BETWEEN NEAR AND FAR FIELDS OF RUBY LASERS A66-38243

PERFORMANCE OF GA AS SEMICONDUCTOR LASER WITH RESONATOR, NOTING DEPENDENCE OF FORBIDDEN ZONE WIDTH AND ABSORPTION COEFFICIENT ON FREE CARRIER CONCENTRATION AND INCIDENT PHOTON ENERGY A66-38955

NEODYMIUM LASER OSCILLATOR USING TIME-VARIABLE REFLECTOR, NOTING LOADING AND DUMPING OF OPTICAL CAVITY WITH NEARLY MAXIMUM AMOUNT OF ENERGY A66-39118

WAVE SYNCHRONIZATION IN GAS LASER WITH RING RESONATOR CAVITY A66-39301

LASER MODE-LOCKING DURING RESONATOR Q-FACTOR MODULATION A66-39303

GAS LASER FREQUENCY AND EMITTED POWER DEPENDENCE ON RESONATOR TUNING A66-39308

THEORETICAL OPTICAL RESONATOR FOR LASER WITH RARE EARTH LIQUID SOLUTIONS AS ACTIVE COMPONENTS A66-39549

FREQUENCY DOUBLING OF LASER LIGHT WITH VARIABLE Q-SWITCHED RESONATOR A66-39654

RUBY LASER PUMPING THRESHOLD ENERGY, DIVERGENCE ANGLE AND OUTPUT POWER AS AFFECTED BY RESONATOR LENGTH A66-39769

DEPENDENCE OF BEAT FREQUENCY OF NEODYMIUM LASER AXIAL MODES ON DISTANCE BETWEEN MIRRORS AND NEODYMIUM ROD POSITION WITHIN RESONATOR A66-41088

RADIATIVE POWER AMPLIFICATION OF HE- NE LASER WITH NEARLY CONFOCAL RESONATORS A66-41453

RESONATOR MISALIGNMENT EFFECT ON OUTPUT OF NEON-HELIUM LASER WITH SPHERICAL MIRRORS A66-41830

ZEEMAN LASER INTERFEROMETER, USING AXIAL MAGNETIC FIELD TO OBTAIN SIMULTANEOUS LEFT- AND RIGHT-HAND CIRCULARLY POLARIZED OSCILLATION MODES AT UPPER AND LOWER CAVITY RESONANCES A66-42248

GIANT PULSE GENERATION RANGE IN TRANSVERSE DIRECTION AFTER Q-SWITCHING IN RUBY LASER, EXAMINING RESONATOR PROPERTIES A66-42516

SINGLE TRANSVERSE AND LONGITUDINAL MODES OBSERVED IN OUTPUT OF PASSIVE Q-SWITCHED RUBY LASER WHEN TWO SPHERICAL MIRRORS ARE USED FOR RESONATOR A66-42563

RING LASER ROTATION RATE SENSOR NOTING RELATION TO  
ELECTROMAGNETIC RADIATION A66-42564

LASER BEAMS AND RESONATORS, DISCUSSING BEAM  
PROPAGATION IN FREE SPACE, GEOMETRICAL OPTICS  
APPLICATION AND RESONATOR MODES IN VIEW OF  
APERTURE DIFFRACTION EFFECTS A66-42806

L F FLUCTUATIONS IN EMISSION OF HE- NE GAS LASER  
MEASURED, USING FABRY- PEROT RESONATOR AND RING-  
TYPE RESONATOR A66-43084

LASER PRODUCING TWO OR THREE LIGHT PULSES IN  
SEQUENCE WITH INTERVAL BETWEEN PULSES MECHANICALLY  
CONTROLLED BY OPTICAL WEDGE INSERTED INTO  
RESONATOR A67-10161

FREQUENCY STABILITY OF DOUBLE BEAM AMMONIA LASER  
WITH THERMOSTATIC QUARTZ RESONATORS ON 3-2 LINE  
A67-10247

SINGLE MODE APPROXIMATION OF PARAMETRIC EXCITATION  
AND SELF-EXCITATION OF OSCILLATIONS IN FABRY-  
PEROT RESONATOR FILLED WITH NONLINEAR DISPERSIVE  
MEDIUM A67-11575

RUBY LASER PUMPING THRESHOLD ENERGY, DIVERGENCE  
ANGLE AND OUTPUT POWER AS AFFECTED BY RESONATOR  
LENGTH A67-12855

RUBY LASER GENERATION FROM TWO R LINES BY  
PRISMATIC LIGHT DISPERSION IN RESONATOR  
A67-13095

REGENERATIVE RADIATION FROM NEON LINE IN HE- NE  
LASER, USING SPHERICAL REFLECTORS IN RESONATOR  
A67-13096

POSSIBLE OSCILLATION MODES IN CYLINDRICAL SOLID  
STATE LASER AND DEPENDENCE OF PUMPING THRESHOLD,  
OUTPUT POWER AND DIVERGENCE ANGLE ON RESONATOR  
LENGTH A67-13129

LINEAR PHASE DISTORTIONS OF PLANE RESONATOR WITH  
TILTED MIRRORS AND EFFECTS ON GENERATION OF  
STIMULATED EMISSION IN RUBY CRYSTAL LASER  
A67-13130

TUNABLE DISPERSION RESONATOR AND BROADENING OF  
LASER EMISSION SPECTRAL RANGE TO OBTAIN OPERATING  
FREQUENCY OTHER THAN FUNDAMENTAL  
A67-13131

STEADY STATE LASER RADIATION DURING RELAXATION,  
DISCUSSING TIME-DEPENDENT SPECTRAL COMPOSITION,  
OSCILLATION MODES AND POLARIZATION CHARACTERISTICS  
A67-13134

PULSED LASER Q-FACTOR MODULATION USING NONLINEAR  
RESONATOR FUNCTIONS IN ABSORBING MEDIUM  
A67-13135

OSCILLATION TYPES FOR GAS-LASER SEMICONCENTRIC  
RESONATOR A67-13286

RADIATIVE POWER AMPLIFICATION OF HE- NE LASER  
WITH NEARLY CONFOCAL RESONATORS  
A67-14190

PERFORMANCE OF GA AS SEMICONDUCTOR LASER WITH  
RESONATOR, NOTING DEPENDENCE OF FORBIDDEN ZONE  
WIDTH AND ABSORPTION COEFFICIENT ON FREE CARRIER  
CONCENTRATION AND INCIDENT PHOTON ENERGY  
A67-15759

LASER BRIGHTNESS GAIN AND SINGLE TRANSVERSE MODE  
OPERATION BY COMPENSATION FOR THERMAL DISTORTION  
WITH EXTERNAL MIRROR A67-16656

ELECTRON DENSITIES IN HELIUM PLASMA MEASURED BY  
LASER AMPLIFIER WITH MAXIMUM GAIN AND MINIMUM  
BANDWIDTH AT POINT NEAREST THRESHOLD  
A67-16663

SUPPRESSION OF UNDESIRABLE AXIAL MODES IN GAS  
LASER OSCILLATING AT SEVERAL FREQUENCIES OBTAINED  
BY FILLING WITH ACTIVE GAS MIXTURE EACH OF TWO  
COUPLED FABRY- PEROT TYPE RESONATORS  
A67-17326

OPERATION OF SYNCHRONIZED NEODYMIUM LASER TIME  
VARIABLE REFLECTION / TVR/ OSCILLATOR, USING  
SINGLE POKKELS CELL TO OBTAIN Q-SWITCHING AND  
CAVITY DUMPING A67-17525

RESONATOR Q-MODULATION TECHNIQUE OBSERVATION OF  
CENTRAL DIP TUNING IN MODULATED POWER OUTPUT OF  
GAS LASER WITH MOVING MIRROR A67-18758

SEMICONDUCTOR MIRROR FOR Q-FACTOR MODULATION OF  
LASER RESONATOR A67-18789

BOOK ON LASERS, LIGHT AMPLIFIERS AND OSCILLATORS  
NOTING OPTICAL RESONATORS, OPTICAL PUMPING, PULSED  
LASERS, ETC A67-19469

TUNING OF GAS LASER RESONATOR A67-19505

TIME BEHAVIOR OF LIGHT EMITTED FROM MANY-ELEMENT  
LASER - MICROWAVE MODELS OF LASER RESONATORS  
ASR-1 N67-10283

OPTICAL SIGNAL  
MULTIPLE SCATTERING EFFECTS ON PROPAGATION OF  
COHERENT OPTICAL SIGNALS STUDIED FOR LASER  
COMMUNICATIONS APPLICATION A66-28580

COHERENT OPTICAL SIGNAL PROCESSORS  
N67-13073

OPTICAL SPECTRUM  
LASER DETECTION OF COHERENT LIGHT AND  
SUPERHETERODYNE AND NONLINEAR PARAMETRIC STUDIES  
IN OPTICAL SPECTRUM A66-27821

DOPPLER SHIFT AND HIGH VELOCITY MIRROR  
TRANSLATION EFFECTS ON MUTUAL OPTICAL COHERENCE  
FUNCTION OF GAS LASER MICHELSON INTERFEROMETERS  
A66-35387

OPTICAL TECHNIQUES IN LASER DETECTION SYSTEMS  
A66-37439

OPTICAL SPECTRA OF ULTRASHORT OPTICAL PULSES  
GENERATED BY MODE-LOCKED GLASS-DOPED NEODYMIUM  
LASERS, CONSIDERING SATURABLE ABSORBER CELL PLACED  
PARALLEL TO FABRY- PEROT REFLECTOR  
A66-39115

GAS LASER FREQUENCY AND EMITTED POWER DEPENDENCE  
ON RESONATOR TUNING A66-39308

LASERS USED TO EXTEND RF PLASMA DIAGNOSTIC  
PROCEDURES TO OPTICAL FREQUENCIES BY  
INTERFEROMETRIC AND THOMSON DIFFUSION METHODS  
A67-13474

LASER SPECTROSCOPY, DISCUSSING ADVANTAGES,  
PRECISION ATTAINABLE, LINE SHAPE AND POSITION  
MEASUREMENTS A67-19087

OPTICAL THICKNESS  
ELECTRON DENSITY, OPTICAL THICKNESS AND  
TEMPERATURE OF RUBY LASER-INDUCED CARBON PLASMA  
A67-16654

OPTICAL TRACKING  
OPTICAL COMMUNICATION FOR MARS EXPLORATION WITH  
OUTLINE OF LASER MODULATORS AND ANTENNAS  
A66-25251

DIGITAL-MODE FM CW LASER RANGING AND TRACKING  
SYSTEM USING COMPOUND AXIS SERVOMECHANISM  
A66-25982

AMPLITUDE AND FREQUENCY MEASUREMENT OF RANDOM  
POSITION FLUCTUATION OF STATIONARY LASER OPTICAL  
SOURCE DUE TO ATMOSPHERIC TURBULENCE  
NASA-TN-D-3439 N66-25558

RESEARCH PROGRAMS ON HOLOGRAPHY, INFRARED LASER,  
DIGITAL FILTER, ANTENNA TRACKING ACCURACY, PCM  
TELEMETRY, OPTICAL TRACKING CONTROL SYSTEM  
NASA-TM-X-55504 N66-31154

NITROGEN-CARBON DIOXIDE 10.6 MICRON LASER FOR  
OPTICAL TRACKING SYSTEM N66-31161

OPTICAL SATELLITE TRACKING ANALYSIS USING PULSED

- LASER REFLECTION N66-32076
- LASER OPTICAL RADAR USED FOR CLEAR AIR TURBULENCE DETECTION  
AFCRL-66-115 N66-38204
- LARGE APERTURE TELESCOPE FOR USE AS COHERENT OPTICAL DEEP SPACE COMMUNICATIONS RECEIVER  
NASA-CR-81677 N67-17946
- OPTICAL TRANSITION**
- FREQUENCY SHIFT IN RESONANCE TRANSITION INDUCED IN POTASSIUM VAPOR BY RUBY LASER PULSE A66-25103
- HELIUM-NEON GAS LASER USED TO STUDY PRESSURE EFFECT ON LINE SHAPE OF 2S-2P OPTICAL TRANSITIONS OF NEON EXCITED STATES A66-26198
- FREQUENCY SHIFT IN RESONANCE TRANSITION INDUCED IN POTASSIUM VAPOR BY RUBY LASER PULSE A66-30282
- INTENSITY AND FREQUENCY EQUATIONS FOR INTERBAND OPTICAL TRANSITIONS AND MULTIMODE PROPERTIES IN SEMICONDUCTOR LASERS A66-39666
- ELECTRON THERMALIZATION EFFECT ON SEMICONDUCTOR LASER BEHAVIOR, NOTING OPTICAL TRANSITION BETWEEN IMPURITY LEVEL AND BAND, TAKING INTO ACCOUNT DIFFUSION PROCESS A66-40790
- TRANSITION TO DETONATION IN GASEOUS MEDIUM EXPERIMENTALLY STUDIED, BASED ON SELF-SUSTAINED DETONATION FRONT AND ADAPTATION OF AMPLITUDE MODULATED GIANT PULSE LASER SYSTEM A67-13500
- HIGH RESOLUTION SPECTROSCOPY USING ZEEMAN-TUNED IR MASER OSCILLATING AT TRANSITIONS BETWEEN 3 AND 9 MICRONS A67-16633
- RELATIVE INTENSITIES AND CASCADE TRANSITION RATIO IN CW AR II LASER NEAR 4103.9 ANGSTROMS A67-19560
- OPTICS**
- NONLINEAR OPTICS, CONSIDERING MAXWELL EQUATION AND NONLINEAR MATERIAL RESPONSE A66-26964
- NONLINEAR OPTICS EMPHASIZING PARAMETRIC OSCILLATION, SELF-FOCUSING AND TRAPPING OF LASER BEAMS AND STIMULATED RAMAN, RAYLEIGH AND BRILLOUIN SCATTERING, USING MAXWELL EQUATIONS AND ELECTRIC DIPOLE APPROXIMATION A66-42810
- LASER DAMAGE OF THIN FILMS - ENERGY DENSITY THRESHOLDS DETERMINED FOR SINGLE QUARTERWAVE AND HALF-WAVE FILMS VACUUM EVAPORATED ON GLASS AND QUARTZ SUBSTRATES  
AD-633554 N66-34015
- PROPERTIES OF FINITE CYLINDRICAL DIELECTRIC RESONATOR - LASER OPTICS  
TG-230-T465 N66-34543
- GAS LASER AND TELESCOPE TECHNIQUES FOR DEEP SPACE OPTICAL COMMUNICATION SYSTEM  
NASA-CR-77482 N66-35245
- OPTICAL NONLINEARITIES MEASURED BY GAUSSIAN LASER BEAM  
ML-1405 N66-39487
- TRANSMIT BEAM OFFSET AND COARSE ACQUISITION SUBSYSTEMS FOR LASER/OPTICS TECHNIQUE BREADBOARD AND ACQUISITION AND TRACK SIMULATION  
NASA-CR-81701 N67-18023
- OPTIMAL CONTROL**
- LASER OUTPUT ENERGY CONTROLLER HAVING EIGHT-TO-ONE IMPROVEMENT IN PULSE REPEATABILITY IN SOLID STATE LASERS A66-36034
- OPTIMIZATION**
- GALLIUM ARSENIDE INJECTION LASER OPTIMIZATION FOR MAXIMUM POWER OUTPUT
- ECOM-2613 N66-24779
- OPTIMAL DESIGN OF ELLIPTICAL PUMPING CHAMBERS FROM NUMERICAL CALCULATIONS CONTAINING ALL GEOMETRIC SIZES OF PUMPING LAMPS AND LASER RODS AND REFLECTIVITY OF WALLS A67-19490
- ORBIT CALCULATION**
- TOPOCENTRIC DISTANCE OF GEODETIC SATELLITE GEOS-A MEASURED BY LASER TELEMETRY FROM STATION A66-30586
- ORGANIC COMPOUND**
- ORGANIC SENSITIZERS FOR EVALUATION OF TRANSITION METAL FLUORESCENCE IN OPTICAL LASER APPLICATION  
NASA-CR-77913 N66-36265
- LASER INDUCED BREAKDOWN OF COMPLEX ORGANIC MOLECULES IN VAPOR STATE, NOTING EMISSION ACCOMPANIED BY FORMATION OF PARTIALLY DISSOCIATED HOT GAS A67-12451
- PUMPING OF ORGANIC DYES IN ORGANIC SOLVENTS, USING PULSED RUBY LASER A67-12515
- LASER BEAM EFFECT ON BENZENE AND OTHER ORGANIC COMPOUNDS, NOTING FORMATION OF DARK READILY COAGULATING DEPOSIT A67-17028
- ENERGY-LOSING BLEACHING MECHANISM OF ORGANIC PHOTOTROPIC CRYSTALS USED FOR RUBY LASER SWITCHES  
ATD-66-119 N67-10437
- ORGANIC LASER**
- ORGANIC LASER SYSTEMS INCLUDING LUMINESCENCE FOR ACHIEVING LASER ACTION, FLUORESCENT AND PHOSPHORESCENT SYSTEMS AND CHEMISTRY AND SPECTROSCOPIC PROPERTIES OF RARE EARTH CHELATES A66-36970
- SELECTIVE FEEDBACK AND SATURATION MECHANISMS OF RAMAN LASERS USING SECONDARY RAMAN LINES, EMPHASIZING CYCLOHEXANE A66-37777
- SYNTHESIS OF MODEL COMPOUNDS AND INTRAMOLECULAR ENERGY TRANSFER FOR ORGANIC LASER MATERIALS, AND SENSITIVE RARE EARTH FLUORESCENCE IN ORGANIC SOLVENTS  
NASA-CR-81780 N67-18123
- ORGANIC PHOSPHORUS COMPOUND**
- DIRECT-EXCITATION LIQUID LASER MEASURED FOR QUANTUM EFFICIENCY FLUORESCENCE  
AD-628526 N66-24728
- OSCILLATION**
- MONOGRAPH ON LASERS INCLUDING GAS LASERS, RUBY LASERS, GIANT-PULSE TECHNIQUES, OSCILLATION MODES, ETC A66-26961
- OSCILLATION CONDITIONS FOR FEEDBACK LASERS, SUPERRADIANT DIRECTIONALLY COHERENT EMISSION LASERS AND COHERENCE BRIGHTENED EMISSION LASERS A66-32628
- MULTIMODE OSCILLATIONS OF SOLID STATE LASER UNDER STATIONARY CONDITIONS EXTENDED TO TREAT CAVITIES WITH LOSSY END MIRRORS OR WITH FREQUENCY DEPENDENT LOSSES  
AFCRL-66-384 N66-33524
- GENERALIZED CALLEN- WELTON THEOREM APPLIED TO CALCULATION OF MASER OSCILLATIONS IN AMPLIFICATION AND GENERATION REGIMES, DETERMINING NOISE SPECTRAL ENERGY AND SPECTRAL LINE WIDTH A67-16350
- PHASE-LOCKING SCHEME FOR FREQUENCY-STABILIZED GAS LASER OSCILLATORS  
NASA-CR-80958 N67-14893
- AUTOMATIC FREQUENCY CONTROL SYSTEM FOR ABSOLUTE FREQUENCY STABILIZATION  
IER-5 N67-15312
- OSCILLATION FREQUENCY**
- OPTICAL RESONATOR DIFFRACTION LOSS, NOTING LASER OSCILLATIONS IN HIGH LOSS ARRANGEMENTS, OUTPUT BEAM POWER, FIELD PATTERNS, ETC

A66-25195

TRANSVERSE AND AXIAL MAGNETIC FIELD EFFECTS ON GAS LASERS; DERIVING EXPRESSION FOR ATOMIC AND MACROSCOPIC POLARIZATION; DETERMINING OSCILLATION MODE CHARACTERISTICS; FREQUENCY RESPONSES, ETC

A66-29813

NONLINEAR INTERACTION OF OSCILLATIONS OF TWO TYPES IN LASER DOES NOT EFFECT STATIONARY OPERATION WHEN OSCILLATIONS ARE SUFFICIENTLY APART IN BAND

A66-37661

FREQUENCY TUNING OF COHERENT EMISSION OVER VIBRONIC CONTINUUM OF PHONON-TERMINATED OPTICAL MASERS BY THERMAL TUNING AND WAVELENGTH-SELECTIVE FEEDBACK

A66-41369

ZEEMAN LASER INTERFEROMETER, USING AXIAL MAGNETIC FIELD TO OBTAIN SIMULTANEOUS LEFT- AND RIGHT-HAND CIRCULARLY POLARIZED OSCILLATION MODES AT UPPER AND LOWER CAVITY RESONANCES

A66-42248

MOLECULAR OSCILLATION DIFFERENCE FREQUENCY GENERATION IN IR SPECTRUM BY BEATING TOGETHER LASER AND LASER-STIMULATED RAMAN EMISSION

A66-42544

RADIATION INTERACTION BETWEEN LASER OSCILLATORS WITH DIFFERENT ACTIVE MATERIALS AND FREQUENCIES

A66-42549

SCATTERING MATRIX ANALYSIS OF SINGLE FREQUENCY MICHELSON TYPE HE- NE GAS LASER, INCLUDING FREQUENCY AND AMPLITUDE STABILITY ANALYSIS OF OSCILLATION SPECTRUM

A66-42566

BEATING OF OSCILLATING FREQUENCIES CORRESPONDING TO TWO DIRECTIONS OF TRAVEL OF ANNULAR CAVITY LASER WITH ACTIVE GAS MEDIUM IN MOVEMENT

A66-43007

OSCILLATION FREQUENCY OF MASER OSCILLATOR CALCULATED USING PERTURBATION THEORY, NOTING TRAVELING WAVE EFFECT

A67-10395

MASER OSCILLATION INTENSITY AND FREQUENCY DEPENDENCE ON CONSTANT ELECTRIC AND MAGNETIC FIELDS ACTING ON MOLECULAR BEAM IN FRONT OF RESONATOR

A67-10396

STEADY STATE REGIME AND STABILITY OF TWO-PHOTON LASER, NOTING FIELD DEPENDENCE OF INTENSITY AND DURATION OF FREQUENCY PULSE AND RESONANCE EXCITATION CURVES

A67-14745

ONSET OF OSCILLATION IN HE- NE LASER ANALYZED USING LAMB THEORY, OBTAINING TIME CONSTANT VALUE FOR POPULATION OF LOWER LASER LEVEL

A67-16821

TRANSIENT BEHAVIOR OF HE- NE LASERS UNDER PULSED HF EXCITATION, DISCUSSING RATE EQUATIONS REPRESENTING ATOMIC POPULATION DENSITY AND PHOTON DENSITY

A67-16980

OSCILLATION OF MASER WITH SINUSOIDAL DISTRIBUTION OF RESONATOR FIELD ALONG AXIS OF MOLECULAR MOTION

A67-17234

SUPPRESSION OF UNDESIRABLE AXIAL MODES IN GAS LASER OSCILLATING AT SEVERAL FREQUENCIES OBTAINED BY FILLING WITH ACTIVE GAS MIXTURE EACH OF TWO COUPLED FABRY- PEROT TYPE RESONATORS

A67-17326

## OSCILLATOR

QUANTUM THEORY FOR NOISE IN STEADY STATE OF LASER OSCILLATOR ABOVE THRESHOLD, COMPARING SEMICLASSICAL AND QUANTIZED LINEAR THEORIES

A66-25650

Q-SWITCHED LASERS, INTERACTION OF HIGH POWER LIGHT PULSE WITH MATTER AND SEMICONDUCTOR LASERS PUMPED WITH OPTICAL RADIATION AND ELECTRON BEAMS INVESTIGATED, USING QUANTUM OSCILLATOR AND AMPLIFIER

A66-26180

FAR- IR LASER MOLECULAR SPECTROSCOPY INCLUDING IR

LASER OSCILLATORS, PHOTON NOISE, DETECTORS AND NUCLEAR OPTICS

A66-26195

PRESSURE EFFECTS IN FABRY- PEROT LOSSY-CAVITY GAS LASER OUTPUT

A66-26199

LASER OSCILLATOR STUDY OF COHERENT STIMULATED EMISSION OF IR TRANSITIONS IN RARE GASES

A66-27336

TIME DEPENDENCY OF PHASE DIFFERENCE OF TWO WEAKLY COUPLED NONLINEAR OPTICAL OSCILLATORS, CONSIDERING COUPLING OF TWO TRAVELING WAVES IN LASER

A66-42257

Q-SWITCHING LASER SYSTEM TO OBTAIN SIMULTANEOUS GIANT PULSES FROM FIVE RUBY LASER OSCILLATORS

A66-42302

OPTICAL PUMPING, THEORY, AND LABORATORY RESEARCH WITH RUBIDIUM MASER OSCILLATORS

N66-36387

OSCILLATION FREQUENCY OF MASER OSCILLATOR CALCULATED USING PERTURBATION THEORY, NOTING TRAVELING WAVE EFFECT

A67-10395

H-2 STOKES RAMAN OSCILLATOR OPERATING AT 9755 ANGSTROMS, FINDING PERFORMANCE AS EXPECTED OF LASER OSCILLATORS WITH BEAM INSTABILITY NOT DEVELOPED

A67-12516

OPERATION OF SYNCHRONIZED NEODYMIUM LASER TIME VARIABLE REFLECTION / TVR/ OSCILLATOR, USING SINGLE POKKELS CELL TO OBTAIN Q-SWITCHING AND CAVITY DUMPING

A67-17525

BOOK ON LASERS, LIGHT AMPLIFIERS AND OSCILLATORS NOTING OPTICAL RESONATORS, OPTICAL PUMPING, PULSED LASERS, ETC

A67-19469

OPTICAL PULSE AMPLIFIERS WITH ACTIVE SATURABLE ABSORPTION SWITCHES

N67-13064

## OSCILLOSCOPE

LASER SYSTEM FOR METEOROLOGICAL DATA USING OSCILLOSCOPE TO DISPLAY RETURN SIGNAL, TRANSLATED AS CONCENTRATIONS OF MATTER OR AEROSOLS

A66-43044

## OXYGEN

LASER OSCILLATION IN FLASH PHOTOLYSIS OF CARBON DISULPHIDE AND OXYGEN TO FORM CO

A66-31941

FLUORESCENCE QUANTUM EFFICIENCIES OF OCTA-COORDINATED EUROPIUM HOMOGENEOUS AND MIXED CHELATES IN ORGANIC SOLVENTS, NOTING EFFECT OF OXYGEN REMOVAL

A66-41153

## OZONE

LASER RADAR RETURNS FROM LOWER TROPOSPHERE COMPARED WITH VERTICAL OZONE DISTRIBUTIONS INDICATE INVERSE RELATIONSHIP

A67-14676

## P

## P-N JUNCTION

GALLIUM ARSENIDE P-N JUNCTION LASER DIODE, INJECTION CURRENT DISTRIBUTION, DENSITY AND EMISSION SPECTRA VARIATION

A66-25934

TIME PARAMETERS OF POWERFUL LASER MEASURED WITH GA AS PHOTODIODE, NOTING TIME CONSTANT AND TIME RESOLUTION OF PHOTODIODE

A66-27750

OPTICALLY CONNECTED LASER CONSTRUCTED ON GALLIUM ARSENIDE P-N JUNCTION, NOTING COHERENT RADIATION

A66-28262

GALLIUM ARSENIDE LASER DESIGN USING P-N JUNCTION OBTAINED BY DIFFUSION OF ZINC IN TELLURIUM DOPED N- GA AS SINGLE CRYSTAL

A66-29057

FREQUENCY STABILITY AND SPECTRAL PURITY OF P-N JUNCTION LASER OUTPUT IMPROVED BY SYNCHRONIZATION WITH GAS LASER BEAM

A66-29717

MINIMUM SPECTRAL LINE WIDTH, THRESHOLD CURRENT

- DENSITY, RADIATION-PEAK DISPLACEMENT AND POSSIBLE RECOMBINATION MECHANISM FOR GA SB LASER DIODE P-N JUNCTIONS IN COHERENT RADIATION A66-31764
- COHERENT EMISSION OF INDIUM ARSENIDE PHOSPHIDE P-N JUNCTION A66-31788
- P-N JUNCTION LASERS FOR SHORT RANGE COMMUNICATIONS, EXAMINING DESIGN, TECHNOLOGICAL PROBLEMS AND PERFORMANCE A66-31956
- PHOTO EMF VARIATION WITH RADIATION POWER OF Q-SWITCH RUBY LASER INCIDENT ON SILICON CRYSTAL WITH P-N JUNCTION A66-32509
- KINETIC THEORY OF SEMICONDUCTOR LASER WITH P-N STEP JUNCTION A66-33126
- LINE WIDTH OF SEMICONDUCTOR LASER A66-33127
- SCANNING ELECTRON MICROSCOPE TO EXAMINE CRYSTAL MOSAIC STRUCTURES AND LASING PROPERTIES OF GALLIUM ARSENIDE LASER DIODES A66-33300
- GALLIUM ARSENIDE LASERS OPERATING AT ROOM TEMPERATURE INVESTIGATED, BASED ON DIFFUSION P-N JUNCTIONS, DISCUSSING EMISSION SPECTRUM A66-36070
- FAR-FIELD LIGHT EMISSION MODE PATTERN OF GA AS DIODE INJECTION LASERS, DIELECTRIC GRADIENT IN INVERSION LAYER AND REFRACTIVE INDEX IN JUNCTION A66-39743
- RECOMBINATION RADIATION FROM GA AS P-N JUNCTIONS WITH AND WITHOUT FABRY-PEROT RESONATOR, NOTING PARAMETER DEPENDENCE ON CURRENT DENSITY A66-40314
- P-N JUNCTION, ELECTROMAGNETIC WAVES OF GALLIUM ARSENIDE SEMICONDUCTOR LASER FTD-TT-65-891/16264 N66-30510
- SURFACE EFFECT ON TEMPERATURE, I-V AND WATT-AMPERE CHARACTERISTICS OF P-N JUNCTION SEMICONDUCTOR INJECTION LASER DIODE AS COHERENT LIGHT SOURCE A67-10077
- VOLT-AMPERE CHARACTERISTICS AND OTHER PROPERTIES OF GA AS LASERS WITH TELLURIUM AND ZN-DOPED EPITAXIAL P-N JUNCTION A67-10080
- MINIMUM SPECTRAL LINE WIDTH, THRESHOLD CURRENT DENSITY, RADIATION-PEAK DISPLACEMENT AND POSSIBLE RECOMBINATION MECHANISM FOR GA SB LASER DIODE P-N JUNCTIONS IN COHERENT RADIATION A67-10085
- COHERENT EMISSION OF INDIUM ARSENIDE PHOSPHIDE P-N JUNCTION A67-10101
- CONTINUOUS COHERENT RADIATION OF GA AS SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT AMBIENT TEMPERATURE OF 77 DEGREES K A67-10548
- CONTINUOUS COHERENT RADIATION OF GA AS SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT AMBIENT TEMPERATURE OF 77 DEGREES K A67-11056
- SURFACE ASPECTS OF THERMAL DEGRADATION OF GA AS P-N JUNCTION LASERS AND TUNNEL DIODES A67-15620
- RECOMBINATION RADIATION OF P-N JUNCTIONS IN GA AS WITH AND WITHOUT FABRY-PEROT CAVITY, DISCUSSING NONEQUILIBRIUM CURRENT CARRIER KINETICS AND I-V CHARACTERISTICS A67-18934
- JUNCTION EFFECTS IN COMPOUND SEMICONDUCTORS AFCL-66-617 N67-15074
- P-TYPE SEMICONDUCTOR**
- SPONTANEOUS AND STIMULATED EMISSION FROM GA AS DIODES WITH THREE-LAYER STRUCTURES CONSISTING OF N-N-P, N-I-P OR N-P-P DIODES A66-40102
- COHERENT RADIATION GENERATION IN ELECTRON-HOLE INDIUM ANTIMONIDE PLASMA, DISCUSSING EMISSION SPECTRUM A66-40319
- SHALLOW DONOR INTRODUCTION IN P-TYPE GA-AS LASER RESULTS IN INCREASED EFFICIENCY OF RADIATIVE RECOMBINATION A67-17280
- PAIR PRODUCTION**
- EXCITATION IN ELECTRON BEAM PUMPED / EBP/ GA AS LASERS INCLUDING ELECTRON SCATTERING, ENERGY DISSIPATION PATTERN, PHONON EMISSION, PAIR PRODUCTION, ETC A66-26181
- PARABOLIC EQUATION**
- CONSISTENT THEORY OF NONLINEAR OPTICAL EFFECTS IN BOUNDED LIGHT BEAMS BY EXTENDING PARABOLIC EQUATIONS TO NONLINEAR PROBLEMS A66-41095
- PARALLEL PLATE**
- SPHERICAL COUPLER FOR FASTENING MIRRORS AND PLANE-PARALLEL PLATES AT BREWSTER ANGLE IN GAS LASER A66-37523
- SCHLIEREN PHOTOGRAPHS OF PLASMA DISCHARGES IN PARALLEL PLATE RAIL TUBE, USING PULSED RUBY LASER AS LIGHT SOURCE A66-41510
- SPHERICAL COUPLER FOR FASTENING MIRRORS AND PLANE-PARALLEL PLATES AT BREWSTER ANGLE IN GAS LASER A67-18394
- PARAMAGNETIC AMPLIFIER**
- DISPERSION CHARACTERISTIC OF STUB SLOW-WAVE STRUCTURE, PARTIALLY FILLED BY DIELECTRIC, OF TRAVELING WAVE MASER A66-28291
- MICROWAVE MIXING IN PARAMAGNETIC CRYSTAL USING TRAVELING WAVE MASER WITH RUBY AS MIXER ELEMENT, NOTING FREQUENCY CONVERSION A67-10003
- PARAMAGNETIC RESONANCE**
- RELATIONSHIP BETWEEN AMPLIFICATION, BANDWIDTH AND NOISE TEMPERATURE IN MASER AMPLIFIER, CONSIDERING PARAMAGNETIC PERMEABILITY AND Q-FACTOR A66-29051
- PARAMAGNETIC RESONANCE SPECTRA SHIFT DUE TO TEMPERATURE CHANGE IN CROSS-RELAXATION RUTILE MASER A66-30820
- PHYSICS LECTURE SUMMARIES INCLUDING LASER BEAMS, ELECTRON SCATTERING, PARAMAGNETIC RESONANCE, PARTICLE ABSORPTION, CHROMOSOMES, AND RELATIVITY ISS-66/19 N66-35043
- TEMPERATURE DEPENDENCE OF PARAMAGNETIC RESONANCE SPECTRAL SHIFTS IN CHROMIUM-DOPED TITANIUM OXIDE CRYSTAL OF CROSS RELAXATION RUTILE MASER A67-19676
- PARAMAGNETISM**
- GAS LASER SPECTROSCOPIC ANALYSIS OF HYPERFINE STRUCTURE, PARAMAGNETIC PROPERTIES, RADIATIVE LIFETIMES AND DOPPLER-BROADENED TRANSITION SATURATION BEHAVIOR OF EXCITED STATES OF XE 129 A67-15462
- PARAMETRIC AMPLIFIER**
- LOW TEMPERATURE TECHNIQUES IN SATELLITE COMMUNICATIONS SYSTEMS, NOTING MASER, COOLED PARAMETRIC AMPLIFIER AND TREND TOWARD CLOSED-CYCLE REFRIGERATORS A66-26104
- SECOND HARMONIC GENERATION OF LIGHT ANALYZED, STRESSING SATURATION EFFECTS OCCURRING AT HIGH LASER POWER, SOLVING NONLINEAR MAXWELL EQUATIONS A66-26144
- LASER DETECTION OF COHERENT LIGHT AND SUPERHETERODYNE AND NONLINEAR PARAMETRIC STUDIES IN OPTICAL SPECTRUM A66-27821
- PARAMETRIC AMPLIFIERS AND LASERS A66-28358
- PARAMETRIC OSCILLATOR THRESHOLD WITH SINGLE MODE OPTICAL MASERS AND OBSERVATION OF AMPLIFICATION IN

- LITHIUM NIOBATE A66-32716
- PARAMETRIC AMPLIFICATION OF FAR IR IN TE CRYSTAL  
PUMPED BY CARBON DIOXIDE LASER A67-13572
- PARAMETRIC AMPLIFIERS AND LASERS A67-16361
- PARAMETRIC OSCILLATOR**  
PARAMETRIC OSCILLATOR THEORY APPLIED TO TUNABLE  
COHERENT OPTICAL PARAMETRIC OSCILLATION IN LITHIUM  
NIOBATE A66-26145
- PARAMETRIC OSCILLATOR THRESHOLD WITH SINGLE MODE  
OPTICAL MASERS AND OBSERVATION OF AMPLIFICATION IN  
LITHIUM NIOBATE A66-32716
- NONLINEAR OPTICS EMPHASIZING PARAMETRIC  
OSCILLATION, SELF-FOCUSING AND TRAPPING OF LASER  
BEAMS AND STIMULATED RAMAN, RAYLEIGH AND  
BRILLOUIN SCATTERING, USING MAXWELL EQUATIONS  
AND ELECTRIC DIPOLE APPROXIMATION A66-42810
- SINGLE MODE APPROXIMATION OF PARAMETRIC EXCITATION  
AND SELF-EXCITATION OF OSCILLATIONS IN FABRY-  
PEROT RESONATOR FILLED WITH NONLINEAR DISPERSIVE  
MEDIUM A67-11575
- THRESHOLD OF PARAMETRIC OSCILLATOR SYSTEM WITH  
IDLER MODES IN SAME FREQUENCY SPACING AS LASER  
PUMP SOURCE A67-16823
- ARGON FM LASER, PARAMETRIC OSCILLATOR, AND  
BACKWARD WAVE OSCILLATOR DEVELOPMENT  
NASA-CR-81730 N67-18019
- PARTICLE ACCELERATION**  
TEMPERATURES, LORENTZIAN WIDTHS AND DRIFT  
VELOCITIES OF EXCITED NEUTRAL AND IONIC SPECIES IN  
ARGON-ION LASER, NOTING THERMAL EQUILIBRIUM  
ACHIEVEMENT A66-28695
- PARTICLE VELOCITY IN GAS PARTICLE TWO-PHASE NOZZLE  
EXPANSION USING GAS LASER AND FABRY- PEROT  
INTERFEROMETER FOR ROCKET ENGINE PROPULSION  
AIAA PAPER 66-522 A66-31500
- PARTICLE BEAM**  
FARADAY ROTATORS FOR HIGH POWER LASER CAVITIES AND  
INTERACTION OF MACROSCOPIC PARTICLES WITH  
COHERENT LIGHT BEAMS  
AFOSR-66-1090 N66-36913
- INTERACTION OF MACROSCOPIC PARTICLES WITH COHERENT  
LIGHT BEAMS N66-36915
- PARTICLE DECAY**  
ATOMIC DEGENERACY INFLUENCE ON MODE INTERACTIONS  
IN GAS LASER A66-39930
- PARTICLE DETECTOR**  
DETECTION OF CEMENT DUST CLOUDS WITH PULSED RUBY  
LIDAR  
UCRL-13204 N66-32847
- PARTICLE EMISSION**  
PARTICLE EMISSION FROM SURFACE INTERACTING WITH  
LASER BEAM A67-12180
- PARTICLE INTENSITY**  
MULTIPHOTON PROCESSES DUE TO LASER ACTION -  
CRITICAL INTENSITY CHARACTERISTICS, COMPTON  
SCATTERING, BREMSSTRAHLUNG, PHOTOELECTRIC  
EFFECT, AND ELIMINATION OF INFRARED DIVERGENCE  
CEA-R-2888 N66-29032
- PARTICLE MOTION**  
DUST PARTICLES IN LASER CAVITY OBSERVED FOR  
ANGULAR STABILIZATION AND CONSTANT VELOCITIES  
A66-26594
- CHARGED PARTICLE MOTION IN MAGNETIC FIELD UNDER  
ACTION OF LASER EMISSION A67-18787
- PARTICLE SIZE**  
HIGH TEMPERATURE SINGLE SOLID PARTICLE PLASMA  
GENERATION BY FOCUSED GIANT PULSE Q-SPOILED RUBY  
LASER BEAM IRRADIATION OF LI H SUSPENDED IN
- VACUUM ELECTRIC FIELDS A67-14047
- PENTAERYTHRITOL TETRANITRATE /PETN/  
LEAD AZIDE AND PENTAERYTHRITATE TETRANITRATE  
EXPLOSION TRIGGERED BY LASER RADIATION**  
A67-19315
- PERFORMANCE CHARACTERISTICS**  
PULSE GENERATOR FOR DRIVING SEMICONDUCTOR LASER  
DIODE, NOTING CIRCUIT DIAGRAM AND OPERATING  
CHARACTERISTICS A66-37588
- PERFORMANCE CHARACTERISTICS FOR PULSE TYPE AR  
LASER WITH EXTERNAL INTERFERENTIAL SYSTEM OF  
QUASI-CONFOCAL SPHERICAL MIRRORS A66-41452
- FERRIC-DOPED-RUTILE 8 MM TRAVELING WAVE MASER,  
NOTING OPERATING RANGE AND PERFORMANCE  
CHARACTERISTICS A67-13986
- PERFORMANCE CHARACTERISTICS FOR PULSE TYPE AR  
LASER WITH EXTERNAL INTERFERENTIAL SYSTEM OF  
QUASI-CONFOCAL SPHERICAL MIRRORS A67-14188
- Y AG SOLID STATE LASER SYSTEM, DISCUSSING OUTPUT,  
THEORETICAL LIMITS, PERFORMANCE CHARACTERISTICS,  
ETC A67-19084
- PERIODIC OSCILLATION**  
PERIODIC UNDAMPED OSCILLATIONS IN POWER INTENSITY  
OF TWO-MODE OPTICAL MASER A66-26217
- PEROXIDE**  
CHEMICAL PUMPED UV LASER ACTION THROUGH THERMAL  
DECOMPOSITION OF DIMETHYL PEROXIDE A66-28836
- PERTURBATION THEORY**  
MODELS OF MATTER-ELECTROMAGNETIC FIELD INTERACTION  
FOR GAS LASERS, USING PERTURBATION THEORY  
A66-26216
- GENERAL NONEQUILIBRIUM SYSTEM IN CONTACT WITH  
RESERVOIR DESCRIBED VIA CORRELATION FUNCTIONS OF  
QUANTIZED FIELD OPERATORS, NOTING INFLUENCE OF  
CAVITY AND OPTICAL PUMP A66-38633
- TIME DEPENDENT SCHROEDINGER EQUATION FOR BLOCH  
ELECTRON IN PRESENCE OF LASER FIELD, USING WKB  
APPROXIMATION METHOD, COMPARED WITH PERTURBATION  
THEORY A66-41266
- OSCILLATION FREQUENCY OF MASER OSCILLATOR  
CALCULATED USING PERTURBATION THEORY, NOTING  
TRAVELING WAVE EFFECT A67-10395
- INTRACAVITY TIME-VARYING PERTURBATION OF LOSSES IN  
GAS LASER USING DIAMAGNETIC FARADAY EFFECT IN  
GLASSES ANALYZED IN CONNECTION WITH OUTPUT  
INTENSITY A67-16646
- PHASE COHERENCE**  
SUM RADIATION FREQUENCY GENERATION BY RUBY AND  
NEODYMIUM LASERS IN KDP CRYSTALS A67-19734
- PHASE DEVIATION**  
TIME DEPENDENCY OF PHASE DIFFERENCE OF TWO  
WEAKLY COUPLED NONLINEAR OPTICAL OSCILLATORS,  
CONSIDERING COUPLING OF TWO TRAVELING WAVES IN  
LASER A66-42257
- PHASE ERROR**  
LINEAR PHASE DISTORTIONS OF PLANE RESONATOR WITH  
TILTED MIRRORS AND EFFECTS ON GENERATION OF  
STIMULATED EMISSION IN RUBY CRYSTAL LASER A67-13130
- PHASE LOCK**  
PHASE LOCKING OF ONE LASER TO ANOTHER BY DIRECT  
INJECTION OF FIRST LASER BEAM INTO SECOND LASER  
CAVITY A66-26593
- PHASE LOCKED LASER LOOP FOR AMPLITUDE AND PHASE  
MEASURING DEVICE FOR COHERENT OPTICAL WAVE FRONTS  
A67-15076

EXCESS PHOTON NOISE IN DETECTED PHOTOCURRENT OF MULTIMODE LASER FOR UNCOUPLED AND PHASE LOCKED MODES A67-16623

PHASE-LOCKING SCHEME FOR FREQUENCY-STABILIZED GAS LASER OSCILLATORS NASA-CR-80958 N67-14893

## PHASE MODULATION

DEMULATION METHOD IN WHICH PHASE MODULATION OF LASER BEAM IS CONVERTED TO AMPLITUDE MODULATION BY AUTOCORRELATION A66-30616

INTERNAL PHASE MODULATION IN HE- NE LASER USING ELECTRO-OPTIC EFFECT IN CRYSTAL QUARTZ, OBSERVING SPECTRUM AND RF MODE BEATS A66-32621

## PHASE SHIFT

OPTICAL LENGTH VARIATIONS IN LASER AMPLIFIERS DETERMINED DURING PUMPING AND AMPLIFICATION, USING INTERFEROMETRY A66-25999

PLASMA DENSITY USING LASER BASED INTERFEROMETER, INTERPRETING PHASE SHIFT OF LASER SIGNAL AS TIME DEPENDENT LASER FREQUENCY VARIATION A66-35817

STABLE LIMITING CYCLES OF LASER RESULTING FROM MUTUAL SYNCHRONIZATION OF PHASE-SHIFTED OSCILLATION MODES A66-39653

## PHONON BEAM

VELOCITY AND LIFETIME OF MICROWAVE THERMAL PHONONS IN LIQUIDS AND SOLIDS DETERMINED BY SPECTRUM OF LIGHT SCATTERING FROM LASER ILLUMINATED SAMPLE A66-26166

EXCITATION IN ELECTRON BEAM PUMPED / EBP/ GA AS LASERS INCLUDING ELECTRON SCATTERING, ENERGY DISSIPATION PATTERN, PHONON EMISSION, PAIR PRODUCTION, ETC A66-26181

FREQUENCY TUNING OF COHERENT EMISSION OVER VIBRONIC CONTINUUM OF PHONON-TERMINATED OPTICAL MASERS BY THERMAL TUNING AND WAVELENGTH-SELECTIVE FEEDBACK A66-41369

## PHOSPHORESCENCE

RUBY PHOSPHORESCENCE UNDER INTENSE OPTICAL EXCITATION, INFERRING POSSIBLE RECOMBINATION CHARACTERISTICS FROM INITIAL BRIGHTNESS DECAY A66-28607

## PHOTIC STIMULATION

CHORIORETINAL LESION PRODUCED BY PULSED RUBY LASER BEAM AND COMPLEX CHANGES IN RETINAL EXCITABILITY IN CATS A66-31761

## PHOTOCATHODE

TRANSLUCENT AND OPAQUE PHOTOCATHODES ANALYSIS A67-19408

## PHOTOCHEMICAL REACTION

SOLID STATE REDUCTION OF LANTHANIDE IONS IN LASER HOSTS, EFFECT OF PRESENCE OF RECOMBINATION HOLE-CENTERS IN PHOTOREduced SAMPLES AND ELIMINATION DURING ELECTROCHEMICAL PROCESS A66-27464

FOCUSED LASER COHERENT RADIATION-INDUCED DEGRADATION OF SOLID METHYLENE AND GAS CHROMATOGRAPHIC ANALYSIS OF REACTION PRODUCTS A66-31870

## PHOTOCHEMISTRY

Q-SWITCHED RUBY LASER USED TO EXPLODE PSEUDO-AIR TARGETS NOLTR-65-152 N66-29965

LASER DAMAGE OF THIN FILMS - ENERGY DENSITY THRESHOLDS DETERMINED FOR SINGLE QUARTERWAVE AND HALF-WAVE FILMS VACUUM EVAPORATED ON GLASS AND QUARTZ SUBSTRATES AD-633554 N66-34015

## PHOTOCONDUCTIVITY

PHOTO EMF VARIATION WITH RADIATION POWER OF Q-SWITCH RUBY LASER INCIDENT ON SILICON CRYSTAL WITH P-N JUNCTION A66-32509

PHOTOCONDUCTIVITY INDUCED IN UNCOLORED SODIUM CHLORIDE AND ALUMINUM OXIDE SINGLE CRYSTALS BY RADIATION FROM RUBY LASER A66-33939

RUBY PHOTOCONDUCTIVITY WHEN EXPOSED TO LASER IRRADIATION, NOTING OSCILLOGRAMS A66-33941

PHOTOCONDUCTIVE AND LUMINESCENT BEHAVIOR OF UNDOPED CADMIUM SULFIDE SINGLE CRYSTALS AT ROOM TEMPERATURE UNDER LASER EXCITATION A66-39165

LASER INDUCED PHOTOCONDUCTIVITY IN CADMIUM SULFIDE SINGLE CRYSTALS REPT.-661 N66-37870

## PHOTOCONDUCTOR

LASER SATURATION OF PHOTOCONDUCTIVITY AND DETERMINATION OF IMPERFECTION PARAMETERS IN SENSITIVE PHOTOCONDUCTORS SUCH AS SINGLE CRYSTAL OF CADMIUM A67-11879

COHERENT HOMODYNE DETECTION AT 10.6 MICROMETERS WITH ALUMINUM-DOPED SILICON PHOTOCONDUCTOR, PRESENTING NOISE SPECTRA AND VOLTAGE A67-13989

## PHOTODETACHMENT

PHOTODETACHMENT PROBABILITY FOR CS AND NEGATIVE I DUE TO SIMULTANEOUS ABSORPTION OF TWO RUBY QUANTA A67-16627

## PHOTODETECTOR

BOOK ON LASER RECEIVERS COVERING NOISE PERFORMANCE, ATMOSPHERIC EFFECTS, DETECTION TECHNIQUES, HARDWARE AND SYSTEMS AVAILABLE, OPTICAL COMMUNICATION IN VISIBLE AND IR SPECTRUM, ETC A66-36060

## PHOTODIODE

TIME PARAMETERS OF POWERFUL LASER MEASURED WITH GA AS PHOTODIODE, NOTING TIME CONSTANT AND TIME RESOLUTION OF PHOTODIODE A66-27750

LOW NOISE PHOTODIODES WITH AVALANCHE MULTIPLICATION FOR HIGH SENSITIVITY, NOTING CAPABILITY FOR LOW INTENSITY WIDEBAND SIGNAL DETECTION, PERFORMANCE IN IR REGION, ETC A66-31934

## PHOTODISSOCIATION

GAS LASER OUTPUT AND THRESHOLD IN POPULATION INVERSION FROM PHOTODISSOCIATION OF METHYL IODIDE AND FLUOROIODIDE METHYLIDYNE A66-35368

PHOTODISSOCIATION LASER SYSTEM, DISCUSSING OUTPUT ENERGY DEPENDENCE ON PRESSURE, TEMPERATURE AND NUMBER OF SUCCESSIVE OPTICAL PUMPING FLASHES A66-37781

## PHOTOELASTIC MATERIAL

MODULATION BY ULTRASONIC DIFFRACTION OF 10.6 MICRON LASER RADIATION IN PHOTOELASTIC CD S, GA AS AND SI CRYSTALS A66-39112

## PHOTOELASTIC STRESS MEASUREMENT

DYNAMIC PHOTOELASTICITY MEASUREMENTS OF STRESS CONCENTRATION, USING RUBY LASER MONOCHROMATIC LIGHT SOURCE A66-34557

## PHOTOELASTICITY

OPTICAL BEAM SCATTERING OF GAS LASER FOR MEASUREMENT OF PHOTOELASTIC CONSTANTS AND APPLICATION TO LITHIUM NIOBATE A66-28692

LASER FOR PHOTOELASTICITY INCLUDING SCATTERED-LIGHT METHOD, CONVENTIONAL TRANSMISSION POLARISCOPE WITH STATIC LOADS AND DYNAMIC PHOTOELASTICITY A66-32072

CONTINUOUS WAVE GAS LASER AS LIGHT SOURCE IN SCATTERED LIGHT STATIC PHOTOELASTICITY A66-37443

## PHOTOELECTRIC APPARATUS

PULSED RUBY LASER PHOTOELECTRIC RECEIVER EXPERIMENTS DETERMINING SATELLITE ORBITS, SUPPLEMENTING BAKER- NUNN CAMERA NETWORK



- A66-42547  
PHOTOELECTRONIC COMPONENTS AND ELECTRONIC MEASUREMENT TECHNIQUES IN RECEPTION AND DEMODULATION OF HF MODULATED LASER BEAMS  
A67-10300
- PHOTOELECTRIC EMISSION  
HIGH POWER LASER BEAM POLARIZATION DIRECTION EFFECTS ON ELECTRON EMISSION FROM AG SURFACE  
A67-18759
- PHOTOELECTROMAGNETIC DETECTOR  
TRANSLUCENT AND OPAQUE PHOTOCATHODES ANALYSIS  
A67-19408
- PHOTOELECTRON  
PHOTOELECTRON COUNTS OF PHOTOMULTIPLIER ILLUMINATED BY GAS LASER LIGHT SOURCE  
A66-26211
- SINGLE-MODE LASER FIELD MODEL CONSISTING OF AMPLITUDE STABILIZED SINE WAVE WITH SLOWLY VARYING RANDOM PHASE PLUS STATIONARY NOISE FIELD  
A66-30127
- NEAR- BOSE- EINSTEIN PROBABILITY DISTRIBUTION OF PHOTOELECTRON COUNTS PRODUCED BY HE- NE GAS LASER NARROW BAND GAUSSIAN LIGHT SOURCE OPERATING SLIGHTLY BELOW OSCILLATION THRESHOLD  
A66-30645
- SMALL SIGNAL MODULATION EFFECT ON PHOTOELECTRON COUNTING OF HE- NE LASER INTENSITY FLUCTUATIONS  
A66-31097
- PHOTOELECTRON EMISSION STATISTICS DETERMINING PROBABILITY DISTRIBUTION OF PHOTOELECTRON COUNTS IN PHOTOMULTIPLIER ILLUMINATED BY LASER BELOW AND ABOVE THRESHOLD OF OSCILLATION  
A66-42543
- CONTINUOUS HELIUM-NEON LASER USED TO OBTAIN SHORT INTENSE LIGHT PULSES AND TO STUDY KINETICS OF AUTOPHOTOELECTRONIC EMISSION OF HIGH RESISTIVITY SILICON  
A67-13142
- PHOTOGRAPHIC APPARATUS  
HIGH SPEED STROBOSCOPIC PHOTOGRAPHY USING KERR CELL MODULATED LASER SOURCE  
A66-30828
- LASER LINE-SCANNING PHOTOGRAPHIC SYSTEM, DISCUSSING POSSIBLE EXTRATERRESTRIAL APPLICATIONS  
A67-19011
- PHOTOGRAPHIC EMULSION  
DEPENDENCE OF MAGNITUDE OF HERSCHEL BLEACHING IN PHOTOGRAPHIC EMULSION ON DELAY BETWEEN FORWARD AND BLEACHING EXPOSURE, USING LASER RADIATION  
A66-28884
- INTERFERENTIAL METHOD OF TESTING HIGH RESOLUTION PHOTOGRAPHIC EMULSIONS, USING LASER AS LIGHT SOURCE  
A67-10832
- PHOTOGRAPHIC MEASUREMENT  
QUANTITATIVE PHOTOGRAPHIC DETERMINATIONS OF LASER BEAM POWER DENSITY DISTRIBUTIONS AND Q-SWITCHED RUBY OSCILLATOR-AMPLIFIER SYSTEM DIVERGENCE CHARACTERISTICS  
A66-41032
- PHOTOGRAPHIC MEASUREMENT OF ENERGY DISTRIBUTION IN BEAM OF Q-SWITCHED RUBY LASER  
NASA-CR-75102 N66-26252
- C W HE- NE LASER COMPARED WITH MERCURY ARC SOURCE, OBTAINING RAMAN SPECTRA OF CARBON TETRACHLORIDE BY THREE METHODS OF EXCITATION  
A67-13912
- PHOTOGRAPHIC RECORDING  
PHOTOGRAPHIC COPIES OF HOLOGRAMS TAKEN WITH LASER LIGHT NOTING FILM, LIGHT SOURCE, DIRECTIONAL EFFECT, PROCESSING, ETC  
A66-26000
- INTERFEROMETRIC PHOTOGRAPHIC TECHNIQUES FOR RECORDING OPTICAL PATH LENGTH VARIATIONS IN PUMPED LASER RODS  
ECOM-2751 N67-14331
- PHOTOGRAPHIC TRACKING  
PHOTOGRAPHIC RADAR SYSTEM EMPLOYING Q-SWITCHED RUBY LASER, MULLARD TYPE 6929 IMAGE TUBE AND CONVENTIONAL CAMERA  
A66-38796
- PHOTOGRAPHY  
CRYSTAL MOTION EFFECT ON TIME BEHAVIOR OF LASER GENERATION MODE, USING HIGH SPEED PHOTOGRAPHY AND OSCILLOGRAMS  
A66-29725
- PHOTOIONIZATION  
NONLINEAR DIELECTRIC LASER LIGHT ABSORPTION BY NEUTRAL GAS RESULTING IN AVALANCHE BREAKDOWN OF GAS DUE TO THERMAL IONIZATION  
A66-25425
- GROWTH RATE OF IONIZATION BY ELECTRON IMPACT IN PRESENCE OF LASER BEAM, ELASTIC AND INELASTIC SCATTERING CROSS SECTIONS, FREE-FREE ABSORPTION, EXCITATION AND IONIZATION COEFFICIENTS, BREAKDOWN TIMES AND THRESHOLDS  
A66-26193
- FAST OVERLAP OF MICROWAVE RADIATION BY IONIZATION AUREOLE OF SPARK IN LASER BEAM  
A66-36719
- MULTIPHOTON IONIZATION OF XENON ATOM IN POWERFUL ELECTRIC FIELD BY RUBY LASER RADIATION  
A66-39545
- GAS DISCHARGE BY LASER PULSE, TAKING INTO ACCOUNT PHOTOIONIZATION DUE TO ELECTRON IMPACT  
A66-41094
- HALATION OF PHOTOIONIZATION OF LIGHT SPARK INVESTIGATED, USING SUPER HIGH FREQUENCY RADIO RADIATION, FOR RUBY LASER  
TT-66-61469 N66-34061
- PHOTODETACHMENT PROBABILITY FOR CS AND NEGATIVE I DUE TO SIMULTANEOUS ABSORPTION OF TWO RUBY QUANTA  
A67-16627
- PHOTOLUMINESCENCE  
PHOTOLUMINESCENCE AND STIMULATED EMISSION OF GALLIUM ARSENIDE AND INDIUM ANTIMONIDE OBTAINED BY OPTICAL PUMPING, NOTING EFFECT OF APPLIED MAGNETIC FIELD ON LASER AND DIODE EMISSIONS  
A66-26182
- SPONTANEOUS AND COHERENT PHOTOLUMINESCENCE IN CADMIUM MERCURY TELLURIDE CRYSTALS EXCITED OPTICALLY BY GA AS DIODE LASER  
A66-29390
- UNFOCUSED RUBY LASER RADIATION FIELD-BIPHENYL COMPOUND INTERACTION, RESULTING LUMINESCENCE AND APPARENT MULTIPHOTON ABSORPTION  
A66-38528
- LUMINESCENCE SPECTRUM OF CU CL AT LOW TEMPERATURES EXCITED BY DOUBLE PHOTON ABSORPTION FROM HIGH INTENSITY LASER BEAM  
A67-17822
- PHOTOLYSIS  
MOLECULAR LASER ACTION BY VIBRATIONAL EXCITATION OF NITRIC OXIDE DURING FLASH PHOTOLYSIS OF NITROSYL CHLORIDE  
A66-39166
- LASER ACTION IN OPTICALLY PUMPED CN, DISCUSSING VIBRATIONAL-ROTATIONAL TRANSITIONS  
A67-10370
- PHOTOMETRY  
PHOTOMETRIC FIGURES OF MERIT FOR VARIOUS SHAPED SEMICONDUCTOR LUMINESCENT SOURCES OPERATING IN SPONTANEOUS MODE  
A66-27495
- PHOTOGRAPHIC MEASUREMENT OF ENERGY DISTRIBUTION IN BEAM OF Q-SWITCHED RUBY LASER  
NASA-CR-75102 N66-26252
- PHOTOMULTIPLIER  
PHOTOELECTRON COUNTS OF PHOTOMULTIPLIER ILLUMINATED BY GAS LASER LIGHT SOURCE  
A66-26211
- INITIAL PULSE IN LUMINOUS EMISSION OF DISCHARGE LASER, USING PHOTOMULTIPLIER PRECEDED BY MOBILE IRIS, DETERMINING GEOMETRICAL DISTRIBUTION OF DISCHARGE BRIGHTNESS  
A66-31209

HIGH TIME RESOLUTION POLARIMETER FOR LASER ANALYSIS, BEAM INTENSITY AFTER PASSING THROUGH ANALYZERS MEASURED BY PHOTOMULTIPLIERS  
A66-37285

TEMPERATURE MEASUREMENTS OF LASER SPARKS FROM RELATIVE INTENSITY OF X-RAY FLUX TRANSMITTED THROUGH BERYLLIUM FOILS OF DIFFERENT THICKNESS  
A66-40421

SELF-LOCKING MODES IN ARGON ION LASER, OBSERVING SUBNANOSECOND PULSATION OF LASER OUTPUT WITH WIDEBAND PHOTOMULTIPLIER  
A67-12503

TWYMAN- GREEN ARRANGEMENT OF INTERFEROMETER WITH NARROW LASER BEAM AND TWIN PHOTOMULTIPLIERS, EXAMINING STRONG SHOCKS IN ARGON IN 15.2 CM SHOCK TUBE  
A67-12688

## PHOTON

PHOTON ECHO, OPTICAL ANALOG OF SPIN ECHO, IN RUBY CRYSTALS, USING RUBY LASER AS EXCITATION SOURCE  
A66-26170

TWO-PHOTON LASER EXCITATION CONDITIONS DETERIORATED BY PRESENCE OF RESONATOR TUNED ON TRANSITION FREQUENCY BETWEEN OPERATING LEVELS OF MATTER  
A66-37143

MULTIPHOTON PROCESSES DUE TO LASER ACTION - CRITICAL INTENSITY CHARACTERISTICS, COMPTON SCATTERING, BREMSSTRAHLUNG, PHOTOELECTRIC EFFECT, AND ELIMINATION OF INFRARED DIVERGENCE  
CEA-R-2888 N66-29032

## PHOTON ABSORPTION

SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION  
A66-27187

CD S SINGLE CRYSTAL OPTICAL GENERATOR DURING EXCITATION BY RUBY LASER, DISCUSSING TWO-PHOTON ABSORPTION COEFFICIENT AT 300 DEGREES K FOR RADIATION FLUX DENSITIES  
A66-27576

LIGHT ABSORPTION BY FREE CURRENT CARRIERS ROLE IN KINETIC EQUATIONS OF SEMICONDUCTOR LASER/RADIATION SYSTEM  
A66-34691

MULTIPHOTON IONIZATION OF KRYPTON AND ARGON BY RUBY LASER RADIATION MAY OCCUR BY ABSORPTION  
A66-36721

QUENCHING OF STIMULATED RAMAN SCATTERING OF COHERENT RADIATION BY TWO-PHOTON ABSORPTION IN ORGANIC LIQUIDS  
A66-43039

SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION  
A66-43085

SPONTANEOUS EMISSION SPECTRA AND RATIO OF NUMBER OF PHOTONS IN VARIOUS OSCILLATION MODES OF LASER WITH NONLINEAR FILTER TYPE LOCK  
A67-11573

LASER SATURATION OF PHOTOCONDUCTIVITY AND DETERMINATION OF IMPERFECTION PARAMETERS IN SENSITIVE PHOTOCONDUCTORS SUCH AS SINGLE CRYSTAL OF CADMIUM  
A67-11879

LIGHT ABSORPTION BY FREE CURRENT CARRIERS ROLE IN KINETIC EQUATIONS OF SEMICONDUCTOR LASER/RADIATION SYSTEM  
A67-14376

OSCILLATION IN CD S CRYSTAL BY RUBY LASER INDUCED TWO-PHOTON EXCITATION, NOTING PROPORTIONALITY OF ABSORPTION COEFFICIENT TO LIGHT BEAM INTENSITY  
A67-16667

MULTIPHOTON ABSORPTION PROCESSES, COHERENCE OF RADIATION FIELDS AND STATISTICAL PROPERTIES OF LASER LIGHT ABSORPTION  
A67-16681

SEMICONDUCTOR LASERS USING SINGLE AND DOUBLE PHOTON OPTICAL EXCITATION  
A67-18930

## PHOTON BEAM

SCATTERING OF ELECTRON BEAM BY STANDING WAVES OF

PHOTONS INSIDE LASER CAVITY CORRESPONDS TO STIMULATED COMPTON EFFECT  
A66-26155

LASER BEAM ENERGY PROFILE DETERMINED BY MULTIPLE-LAYER ALUMINUM FOIL TECHNIQUE  
A66-31217

POLYA DISTRIBUTION DESCRIBING PHOTON CORRELATIONS IN IONIZING LASER BEAMS ENABLES DIFFERENTIATION BETWEEN VARIOUS MULTIPHOTON IONIZATION PROCESSES  
A67-13982

MULTIPHOTON IONIZATION OF KRYPTON ATOM BY RUBY LASER RADIATION  
A67-18796

PHOTON COUNTING DISTRIBUTIONS AND INTENSITY FLUCTUATIONS OF MODULATED LASER BEAMS  
A67-20125

## PHOTON DENSITY

LASER OPERATED WITH SATURABLE FILTER FOR Q-SWITCHING, NOTING TWO MODES OF EXCITATION /SOFT AND HARD REGIME/  
A66-32314

GAIN FACTOR VARIATION WITH THRESHOLD CURRENT IN REFLECTIVE AND ANTIREFLECTIVE FILMS OF GA AS LASER WITH PHOTON AND CURRENT DENSITIES  
A66-38388

FIRST AND SECOND ORDER CORRELATION FUNCTIONS FOR FIELD OBTAINED BY SUPERPOSITION OF TWO LASER MODES THROUGH YOUNGS EXPERIMENT, USED TO DETERMINE COHERENCE AND STATISTICAL PROPERTIES  
A67-12634

EXCESS PHOTON NOISE IN DETECTED PHOTOCURRENT OF MULTIMODE LASER FOR UNCOUPLED AND PHASE LOCKED MODES  
A67-16623

PARTICLE NUMBER FLUCTUATION IN SINGLE CELL OF KASTLER PHOTON SET, DISCUSSING STATISTICAL PROPERTIES OF LASER EMISSION IN MULTIMODE EXCITATION REGIME  
A67-19599

## PHOTON-ELECTRON INTERACTION

NEON LEVEL BROADENING UNDER EFFECT OF LASER RADIATION STUDIED BY OBSERVING HANLE EFFECT ON FLUORESCENT LIGHT  
A66-29640

THRESHOLD CURRENT DENSITY DEPENDENCY ON PHOTON ENERGY IN GALLIUM ARSENIDE LASER DIODES  
A67-13480

## PHOTOTRANSISTOR

DIFFUSELY TRANSMITTING INTEGRATING SPHERE WITH SOLID STATE PHOTODIODE USED IN LASER OUTPUT MEASUREMENT  
A67-10445

## PHYSICAL PROPERTY

MEASUREMENTS ON PHYSICAL AND LASER PROPERTIES OF VAPOR-GROWN RUBY SINGLE CRYSTALS PREPARED BY EPITAXIAL GROWTH  
A66-36081

PHYSICAL PROPERTIES AND OPERATING CHARACTERISTICS OF EUROPIUM AND RARE EARTH CHELATE LASERS  
TR-66-052.13 N67-12533

## PHYSICS

SOLID STATE DEVICE, LASER, MATERIALS, AND PHYSICS RESEARCH PROJECTS  
ESD-TDR-65-553 N66-23942

RESEARCH REPORTS ON PHYSICS OF LASER RADIATION, OPTICAL RADAR SYSTEMS, CORNER REFLECTOR ON LUNAR SURFACE, PHOTON CORRELATIONS AND COUNTING STATISTICS, AND COLD CATHODES FOR GAS LASERS  
NASA-CR-81248 N67-16014

## PINCH EFFECT

HELIUM-NEON GAS LASER USED TO DETERMINE ELECTRON DENSITY VARIATION, SPATIAL AND TEMPORAL, IN AFTERGLOW OF Z-PINCH IN H AT 100 MTORR  
A66-26239

FORMATION OF MAGNETIC PINCH IN ELECTRON-HOLE PLASMA IN IN SB AND POSSIBILITY OF POPULATION INVERSION IN PINCH  
01-82-0502 N66-29169

**PITCH CONTROL**

THEORETICAL EXISTENCE OF OPTIMUM PITCH GIVING  
MAXIMUM NET GAIN FOR TRAVELING WAVE MASERS, USING  
SLOW WAVE STRUCTURES A66-27958

**PLASMA**

LASER PHASOGRAPHY OF JETS, SHOCK WAVES, AND  
PLASMAS  
AFCRL-66-299 N66-33273

**PLASMA ARC**

ELECTRON TEMPERATURE AND CONCENTRATION IN DC  
PLASMA ARC DETERMINED FROM THOMSON SCATTERING OF  
LASER RADIATION A66-33840

ELECTRON TEMPERATURE AND CONCENTRATION IN DC  
PLASMA ARC DETERMINED FROM THOMSON SCATTERING OF  
LASER RADIATION A67-13209

**PLASMA CONDUCTIVITY**

SELF-FOCUSING OF LASER BEAM IN PLASMA, SOLVING  
WAVE EQUATION FOR SLAB AND CYLINDRICAL BEAM  
CONFIGURATIONS A67-12089

**PLASMA CYLINDER**

OPTICAL TRANSMISSION OF PLASMA COLUMN GENERATED BY  
IONIZED GAS EXPLOSION DETERMINED, USING LASER BEAM  
A66-42998

**PLASMA DENSITY**

LASER BEAM TECHNIQUES FOR STUDY OF PLASMAS WITH  
HIGH ELECTRON DENSITIES A66-26822

LASER RADIATION TO DETERMINE ELECTRON DENSITY IN  
DENSE HIGH TEMPERATURE PLASMA A66-27507

PLASMA DENSITY USING LASER BASED INTERFEROMETER,  
INTERPRETING PHASE SHIFT OF LASER SIGNAL AS TIME  
DEPENDENT LASER FREQUENCY VARIATION A66-35817

ELECTRON AND NEUTRAL ATOM DENSITIES IN HELIUM AND  
ARGON AFTERGLOW PLASMA OBTAINED BY TWO HELIUM-NEON  
LASER INTERFEROMETERS, NOTING TEMPORAL DEPENDENCE  
OF ELECTRON DECAY A66-41364

LASER INDUCED PLASMA DENSITY MEASUREMENT USING  
MULTIPLE BEAM INTERFEROMETRY A66-41630

THREE-MIRROR LASER INTERFEROMETER MEASURING  
ELECTRON DENSITIES IN REPETITIVELY PULSED PLASMAS  
A67-11875

ELECTRON COLLISION RATE AND DENSITY CALCULATIONS  
FOR HE- NE LASER PLASMA A67-16598

**PLASMA DIFFUSION**

STRONG AXIAL MAGNETIC FIELD EFFECT ON CONSTANT  
CURRENT DISCHARGE IN CONTINUOUS-DUTY ION LASER,  
NOTING PLASMA DIFFUSION, CHARGED PARTICLE DENSITY  
AND LASER OUTPUT DECREASE A66-33117

LASERS USED TO EXTEND RF PLASMA DIAGNOSTIC  
PROCEDURES TO OPTICAL FREQUENCIES BY  
INTERFEROMETRIC AND THOMSON DIFFUSION METHODS  
A67-13474

**PLASMA DISCHARGE**

PULSED TOROIDAL EXCITATION OF GAS ION LASERS  
EXTENDED TO DRIVE HIGH POWER CW LASER TRANSITIONS  
IN AR, KR, CL AND BR, NOTING OPERATING  
PARAMETERS AND POWER OUTPUT A66-28877

TRANSMISSION OF LUMINOUS FLUX DUE TO IONIZATION OF  
GASES BY HIGH POWER LASER, MEASURING ENERGY  
ABSORPTION IN IONIZED ZONE A66-36255

LONGITUDINAL MAGNETIC FIELD EFFECT UPON GAS  
DISCHARGE, ZEEMAN EFFECT AND FARADAY EFFECT IN  
HE- NE GAS LASER A66-40586

SCHLIEREN PHOTOGRAPHS OF PLASMA DISCHARGES IN  
PARALLEL PLATE RAIL TUBE, USING PULSED RUBY LASER  
AS LIGHT SOURCE A66-41510

**PLASMA DISPERSION**

SCATTERED LIGHT SPECTRUM IN THETATRON PLASMA,  
NOTING ONSET OF ION WAVE INSTABILITY  
A67-10248

**PLASMA DYNAMICS**

RADIO ELECTRONICS, DISCUSSING QUANTUM ELECTRONICS,  
LASERS, MICROWAVE DEVICES AND TECHNOLOGY, PLASMA  
PHYSICS, ETC A67-18072

OPTICAL HETERODYNE SYSTEM USED TO MEASURE ELECTRON  
DENSITY OF PLASMA  
NASA-CR-79511 N67-11738

**PLASMA-ELECTROMAGNETIC INTERACTION**

COOPERATIVE INTERACTIONS BETWEEN IONS AND  
ELECTRONS IN FORWARD SCATTERING OF RUBY LASER BEAM  
FROM PLASMA A66-30153

NONLINEAR SCATTERING OF RUBY LASER BEAM BY PLASMA  
AT SECOND AND THIRD HARMONIC A66-32433

COOPERATIVE SCATTERING OF LASER LIGHT BY THETATRON  
PLASMA A66-35489

STATISTICAL DETERMINATION OF CORRELATION FUNCTIONS  
OF PLASMA SCATTERED COHERENT LIGHT  
A67-17824

**PLASMA FLOW**

PLASMA FLOW VELOCITY PROFILE MEASUREMENT BY  
ELECTROSTATIC PROBE DETECTION OF PLASMA DROP  
CAUSED BY GAS BREAKDOWN DUE TO FOCUSED GIANT PULSE  
LASER A66-38395

**PLASMA GENERATION**

ENERGY-RICH PLASMAS PRODUCED BY LIGHT PULSES FROM  
Q-SWITCHED LASER, NOTING ENERGY TRANSFER FROM  
ELECTRONS TO IONS DURING EXPANSION PROCESS  
A66-27607

IONIZATION OF AIR WITH LASER RADIATION IN SPIKE  
MODE A66-31150

MULTIPHOTON PLASMA PRODUCTION AND STIMULATED  
RECOMBINATION RADIATION IN LEAD TELLURIDE,  
CONSIDERING ELECTRON-HOLE PAIR PRODUCTION RATE  
A66-31884

PLASMA PRODUCTION BY FIRING GIANT PULSE LASER AT  
SOLID DEUTERIUM PELLET /ICE/, NOTING STRONG  
ANISOTROPY IN PLASMA OUTBURST A66-36595

HIGH TEMPERATURE HIGH-DENSITY PLASMA FROM SINGLE  
SOLID PARTICLE OF LITHIUM HYDRIDE SUSPENDED IN  
VACUUM, USING RUBY LASER IRRADIATION  
A66-36596

X UV C, TI, MN, FE, NI, CU, ZN AND AR LINE  
SPECTRA AND CONTINUUM RADIATION SPECTRA IN PLASMAS  
PRODUCED BY FOCUSED RUBY LASER BEAM  
A66-39812

THEORY AND DESIGN OF HIGH POWER LASER FOR  
PRODUCING PLASMAS IN THIN POLYETHYLENE TARGET  
LA-3369 N66-32449

EXPANSION VELOCITY OF LUMINOUS FRONT OF PLASMA  
PLUME GENERATED BY GIANT PULSE LASER  
A67-13573

HIGH TEMPERATURE SINGLE SOLID PARTICLE PLASMA  
GENERATION BY FOCUSED GIANT PULSE Q-SPOILED RUBY  
LASER BEAM IRRADIATION OF LI H SUSPENDED IN  
VACUUM ELECTRIC FIELDS A67-14047

PLASMA FORMED BY LASER PULSE ON TUNGSTEN TARGET,  
MEASURING RADIUS, TEMPERATURE AND RADIATIVE  
PROPERTIES, DEVELOPING MODEL A67-18149

**PLASMA GENERATOR**

PRODUCTION OF NEUTRAL OR IONIZED GAS PLASMOIDS BY  
FOCUSING BEAM OF COHERENT LIGHT EMITTED BY RUBY  
LASER ON TARGET OF PURE METAL OR METAL CONTAINING  
GAS A66-26819

TIME RESOLVED AND TIME INTEGRATED MEASUREMENTS OF  
PLASMA PRODUCED BY Q-SWITCHED LASER BEAM  
FOCUSED ON SURFACE OF METALLIC SOLID  
NOLTR-66-96 N67-17906

**PLASMA GUN**

CONTROLLED THERMONUCLEAR STUDIES - CAULKED STUFFED  
CUSP MINIMUM- B MACHINE, SCYLLA OPERATION AND

- MEASUREMENTS, RUBY LASER TESTING, PLASMA GUNS,  
AND ELECTRIC AND MAGNETIC FIELD MEASUREMENTS  
LA-3434-MS N66-25226
- PLASMA HEATING**  
THERMALIZATION OF PLASMA BY CREATING IMPLODING  
SHOCK WAVE DRIVEN BY LASER ENERGY RELEASE A66-26683
- HEATING AND SCATTERING OF PLASMA PRODUCED BY  
GIANT LASER PULSE FOCUSED ON SOLID TARGET A67-14194
- PLASMA INSTABILITY**  
NONLINEAR INCOHERENT SCATTERING OF LASER BEAM FROM  
PLASMA R66SD40 N66-36016
- PLASMA JET**  
SCATTERING OF LIGHT FROM PULSED RUBY LASER BY  
PLASMA JET, NOTING CROSS SECTION, ELECTRON-PHONON  
INTERACTION, ETC A66-30139
- LASER, ELECTRON AND PLASMA ENERGY BEAM TYPES AND  
APPLICATION TO MANUFACTURING TECHNOLOGY A67-12179
- TREATMENT OF STEEL WITH LASER BEAM, OBTAINING  
PRECISION HOLES WITHOUT AFFECTING MICROHARDNESS OF  
METAL A67-18234
- PLASMA OSCILLATION**  
GAS LASER ALIGNMENT, OBTAINING OSCILLATION ON  
THREE LINES OF HE- NE LASER A66-39718
- PLASMA FLUCTUATION EFFECT ON GAS LASER NOISE,  
NOTING RELATION BETWEEN MODULATION AMPLITUDE OF  
LIGHT OUTPUT AND FREQUENCY NOISE AND OSCILLATION  
SPECTRUM A66-41294
- PLASMA-PARTICLE INTERACTION**  
ATOMIC COLLISIONS, EXCITATION TRANSFER PROCESSES  
AND ENERGY LEVEL TRANSITION PROBABILITIES IN  
PLASMA OF GAS LASERS A66-39305
- PLASMA PHYSICS**  
SOVIET AND FOREIGN PAPERS ON PLASMA DIAGNOSTICS  
BY SCATTERING OF LASER BEAMS AT PLASMA ELECTRONS  
A66-34967
- OPTICAL AND ELECTRON INTERACTIONS WITH METASTABLES  
- AFTERGLOW PLASMA IONIZATION PROCESS  
REPT-24 N66-26512
- PLASMA PROPERTIES USING LASERS AND SPECTROSCOPY -  
TRANSMISSION DESIGN REQUIREMENTS FOR AIRCRAFT  
GAS TURBINES N66-27060
- RUBY LASER WHICH PRODUCES TRIGGERABLE GIANT LASER  
PULSES BY Q-SWITCHING WITH SELECTIVE SATURABLE  
ORGANIC DYE IPP-4/34 N66-28336
- LANGMUIR PROBE USE FOR ELECTRON TEMPERATURE  
DETERMINATION IN LASER-INDUCED PLASMA  
BRL-MR-1715 N66-28920
- FORMATION OF MAGNETIC PINCH IN ELECTRON-HOLE  
PLASMA IN IN SB AND POSSIBILITY OF POPULATION  
INVERSION IN PINCH D1-82-0502 N66-29169
- FREQUENCY DISTRIBUTION MEASUREMENTS OF RUBY LASER  
LIGHT SCATTERED BY THETATRON PLASMA  
CLM-P-104 N66-35301
- PLASMA PHYSICS STUDIES - LASER INTERFEROMETER TO  
MEASURE STRAIN RATE AT KERN RIVER FAULT, PLASMA  
DIFFUSION, ALFVEN WAVES IN RELATIVISTIC WAVES,  
AND PLASMA RADIATION FROM SILVER FOILS N66-36419
- LASERS USED TO EXTEND RF PLASMA DIAGNOSTIC  
PROCEDURES TO OPTICAL FREQUENCIES BY  
INTERFEROMETRIC AND THOMSON DIFFUSION METHODS  
A67-13474
- MICROWAVE RESEARCH ON ELECTROACOUSTIC AMPLIFIERS,  
OPTICAL MASERS, STIMULATED RAMAN EFFECT,
- ACOUSTIC WAVE OPTICS, SEMICONDUCTOR OSCILLATION,  
NONUNIFORM PLASMAS, AND FERROMAGNETIC METALS  
ML-1464 N67-16325
- ACOUSTIC WAVE AMPLIFICATION, OPTICAL MASER,  
TUNABLE LASER, ACOUSTIC WAVE OPTICS, NONUNIFORM  
PLASMA THEORY, SEMICONDUCTOR OSCILLATION, AND  
FERROMAGNETIC METAL STUDIES IN MICROWAVE PROGRAM  
ML-1436 N67-16339
- PLASMA PINCH**  
MAGNETICALLY COMPRESSED PLASMA AS HIGH INTENSITY  
SOURCE OF NEAR UV AND VISIBLE RADIATION  
EXPERIMENTALLY STUDIED IN DYNAMIC PINCH A67-11880
- FARADAY ROTATION MEASUREMENT OF TRAPPED MAGNETIC  
FIELDS IN THETA PINCH PLASMA, USING GAS LASER BEAM  
A67-17447
- PLASMA PROBE**  
ELECTROSTATIC PROBE MEASUREMENTS OF VELOCITY  
DISPLACEMENT AND ELECTRON DENSITY OF PLASMA USING  
LASER COMPARED WITH MEASUREMENTS USING MICROWAVE  
INTERFEROMETER A66-28269
- LASER ACTION DELAY DUE TO PLASMA-TUBE-SURFACE  
DECOMPOSITION RESULTING FROM BOMBARDMENT BY NEON  
IONS A67-15110
- LASER STUDIES AT RCA VICTOR RESEARCH  
LABORATORIES, MONTREAL, DISCUSSING  
SPECTROSCOPIC, INTERFEROMETRIC AND PLASMA  
DIAGNOSTIC RESEARCH A67-19082
- PLASMA RADIATION**  
COHERENT RADIATION GENERATION IN ELECTRON-HOLE  
INDIUM ANTIMONIDE PLASMA, DISCUSSING EMISSION  
SPECTRUM A66-40319
- PLASMA FORMED BY LASER PULSE ON TUNGSTEN TARGET,  
MEASURING RADIUS, TEMPERATURE AND RADIATIVE  
PROPERTIES, DEVELOPING MODEL A67-18149
- PLASMA RESONANCE**  
PLASMA RESONANCE AND SCATTERING, THRESHOLD  
VARIATION AND OPTICAL REFLECTIVITY IN PULSED LASER  
BEAM-INDUCED GAS BREAKDOWN A66-26192
- PLASMA STABILITY**  
RESEARCH ON PLASMA STABILITY, BEAM INTERACTIONS,  
AND ELECTRIC BREAKDOWN OF GAS BY LASER  
EUR-CEA-FC-352 N67-14307
- CALCULATIONS AND EXPERIMENTS TO DETERMINE ION WAVE  
INSTABILITY IN STEADY STATE DISCHARGE, LASER  
BREAKDOWN IN PLASMA, AND MICROWAVE SCATTERING  
FROM STANDING PLASMA WAVES N67-14628
- PLASMA TEMPERATURE**  
ELECTRON DENSITY, OPTICAL THICKNESS AND  
TEMPERATURE OF RUBY LASER-INDUCED CARBON PLASMA  
A67-16654
- PLASMA THEORY**  
OPERATION OF Q-SWITCHING DEVICE BASED ON  
FARADAY EFFECT AND USED WITH RUBY LASER FOR  
APPLICATION TO PLASMA DIAGNOSTICS A66-36079
- PLASMOID**  
PRODUCTION OF NEUTRAL OR IONIZED GAS PLASMOIDS BY  
FOCUSING BEAM OF COHERENT LIGHT EMITTED BY RUBY  
LASER ON TARGET OF PURE METAL OR METAL CONTAINING  
GAS A66-26819
- PLASMON**  
CROSS SECTION FOR INELASTIC SCATTERING OF  
ELECTROMAGNETIC RADIATION BY ELECTRON DENSITY  
FLUCTUATIONS IN ANISOTROPIC SOLIDS, USING LASER  
SOURCES, INVESTIGATING LANDAU AND COLLISION  
DAMPING OF PLASMONS A66-26153
- PLATINUM**  
HOMOGENIZING METHODS FOR PLATINUM-FREE LASER  
GLASS, AND MELTING OF HIGH-PURITY LASER GLASS IN  
ALL-CERAMIC SYSTEM SATR-3 N66-30525

## POCKEL EFFECT

LASER LIGHT MODULATION BY POCKELS OR KERR EFFECT  
FOR APPLICATION TO TELECOMMUNICATIONS SYSTEM,  
EXAMINING ELECTRICAL BIREFRINGENCE MODULATION  
A66-36262

ELECTRO-OPTIC LIGHT MODULATION USING POCKEL AND  
KERR EFFECTS IN CRYSTALS FOR COMMUNICATIONS  
APPLICATIONS, USING LASERS A66-42811

S HF MODULATION TECHNIQUES FOR LASER RADIATION,  
COVERING FARADAY, KERR AND POCKEL EFFECTS,  
CIRCULAR DICHROISM, ETC A67-13138

FLUORESCENT EMISSION OF NEODYMIUM LASER TRIGGERED  
BY POCKELS EFFECT AS FUNCTION OF POPULATION  
INVERSION A67-13201

OPERATION OF SYNCHRONIZED NEODYMIUM LASER TIME  
VARIABLE REFLECTION / TVR/ OSCILLATOR, USING  
SINGLE POCKELS CELL TO OBTAIN Q-SWITCHING AND  
CAVITY DUMPING A67-17525

## POISSON DISTRIBUTION

REPLACEMENT OF POISSON BY POLYA DISTRIBUTION IN  
CALCULATING LASER INTENSITY THRESHOLD NECESSARY TO  
INDUCE IONIZATION BREAKDOWN IN GASES  
A66-39715

QUANTUM THEORY OF Q-SPOILED LASER, NOTING  
STATISTICS OF NUMBER OF PHOTONS IN MODE BEAR  
QUALITATIVE RESEMBLANCE TO POISSON STATISTICS  
A66-41373

## POLARIZATION CHARACTERISTICS

GAS LASER WITH GENERALIZED POLARIZATION  
CHARACTERISTICS, NOTING ROLE OF DEGENERATE ATOMIC  
ENERGY LEVELS A66-36005

ZEEMAN LASER INTERFEROMETER, USING AXIAL MAGNETIC  
FIELD TO OBTAIN SIMULTANEOUS LEFT- AND RIGHT-HAND  
CIRCULARLY POLARIZED OSCILLATION MODES AT UPPER  
AND LOWER CAVITY RESONANCES A66-42248

POLARIZATION OF LIGHT SCATTERED FROM HE- NE LASER  
BEAM, APPLYING QUANTUM THEORY TO FORMULA FOR  
DEPOLARIZATION RATIO A67-15624

NONLINEAR MEDIUM ANISOTROPY AND SATURATION  
EFFECTS ON ORIENTATION OF POLARIZATION ELLIPSE OF  
GAS LASER MODE A67-17823

POLARIZATION CHARACTERISTICS OF IONIZED ARGON  
LASER IN MAGNETIC FIELD A67-18542

## POLARIZED LIGHT

MAGNETIZATION INDUCED BY CIRCULARLY POLARIZED  
LASER LIGHT INCIDENT ON NONABSORBING MATERIAL, IN  
ABSENCE OF EXTERNAL MAGNETIC FIELD, IN DOPED  
CALCIUM FLUORIDE PROPORTIONAL TO LIGHT INTENSITY  
AND VERDET CONSTANT A66-26142

HIGH TIME RESOLUTION POLARIMETER FOR LASER  
ANALYSIS, BEAM INTENSITY AFTER PASSING THROUGH  
ANALYZERS MEASURED BY PHOTOMULTIPLIERS  
A66-37285

OPTICAL SYSTEM CONSISTING OF POLARIZED LASER BEAMS  
FOR MONITORING MISSILE ATTITUDE DURING EARLY  
LAUNCH PHASE A67-14505

HIGH POWER LASER BEAM POLARIZATION DIRECTION  
EFFECTS ON ELECTRON EMISSION FROM AG SURFACE  
A67-18759

SENARMONT POLARISCOPE APPLIED TO ANALYSIS OF  
OPTICAL MASER LIGHT N67-17278

## POLARIZED RADIATION

GAS LASER EMISSION IN WEAK LONGITUDINAL MAGNETIC  
FIELD ASSUMING ZEEMAN SPLITTING IS MUCH SMALLER  
THAN DOPPLER LINEWIDTH A66-32319

POLARIZATION OF PULSED RADIATION FROM GA AS LASER  
DIODE TO DETERMINE ORIGIN OF NATURAL OSCILLATIONS  
OF RESONATOR A66-37549

ABSORPTION COEFFICIENTS FOR ALPHA-POLARIZED  
RADIATION USING RUBY LASER AS COHERENT SOURCE AND

EBERT SPECTROMETER AS INCOHERENT SOURCE  
TR-4 N66-34159

## POLYETHYLENE

THEORY AND DESIGN OF HIGH POWER LASER FOR  
PRODUCING PLASMAS IN THIN POLYETHYLENE TARGET  
LA-3369 N66-32449

## POLYMETHYL METHACRYLATE

POLYMETHYL METHACRYLATE AND POLYSTYRENE EXPOSURE  
TO RUBY AND NEODYMIUM-GLASS LASER RADIATION,  
NOTING APPEARANCE OF EPR A67-10075

## POLYPROPYLENE

CHANGES IN GIANT MOLECULE STRUCTURE OF  
POLYPROPYLENE FILMS UNDER ACTION OF LASER PULSES  
ANALYZED BY OPTICAL MICROSCOPY A67-19169

## POLYSTYRENE

POLYMETHYL METHACRYLATE AND POLYSTYRENE EXPOSURE  
TO RUBY AND NEODYMIUM-GLASS LASER RADIATION,  
NOTING APPEARANCE OF EPR A67-10075

## POPULATION

NONEQUILIBRIUM POPULATION BUILDUP AND DETECTION  
FOR IR SOLID STATE LASERS AND I R-OPTICAL  
DOUBLE RESONANCE IN LANTHANUM CHLORIDE CRYSTAL  
A66-26177

LINEARIZED POPULATION RATE EQUATIONS AND QUANTUM  
NOISE SOURCES USED TO CALCULATE SPECTRA OF  
INTRINSIC SECOND MOMENT INTENSITY FLUCTUATIONS IN  
3- AND 4-LEVEL CW LASER OSCILLATORS  
A66-42548

## POPULATION INVERSION

DEPOPULATION OF GROUND STATE CHROMIUM IONS IN RUBY  
UNDER OPTICAL PUMPING EXPLAINED VIA RATE EQUATIONS  
A66-25188

TRANSITION PROBABILITIES AND LIFETIMES IN IONIZED  
ARGON GAS LASERS A66-26207

PROPAGATION RATE OF HIGH POWER LASER LIGHT PULSE  
IN INVERSELY POPULATED MEDIUM A66-29980

DEGREE OF EXCITATION OF METASTABLE STATE  
DETERMINED, USING LUMINESCENCE SATURATION  
PHENOMENON, CALCULATING POPULATION OF WORKING  
LEVEL OF LASER SUBSTANCE A66-30846

LASER OPERATED WITH SATURABLE FILTER FOR Q-  
SWITCHING, NOTING TWO MODES OF EXCITATION /SOFT  
AND HARD REGIME/ A66-32314

VIBRATIONAL EXCITATION, POPULATION INVERSION AND  
COUPLING OUT OF CARBON DIOXIDE-NITROGEN-WATER  
VAPOR LASER A66-33758

GAS LASER OUTPUT AND THRESHOLD IN POPULATION  
INVERSION FROM PHOTODISSOCIATION OF METHYL IODIDE  
AND FLUOROIODO METHYLIDYNE A66-35368

DERIVATION OF TWO EQUATIONS FOR ELECTROMAGNETIC  
FIELD AND POPULATION INVERSION IN SOLID STATE  
LASER A66-35370

LASER ACTION IN CLOSED MOLECULAR SYSTEM WITH  
MIXTURE OF CARBON DIOXIDE, NITROGEN AND WATER  
VAPOR, NOTING COUPLING-OUT PLATE REFLECTIVITY AND  
POPULATION INVERSION A66-35433

STIMULATED EMISSION PROCESSES INTERPRETING OH  
MICROWAVE EMISSION FROM POINTS IN SKY, USING  
ANISOTROPIC UV RADIATION WHICH LEADS TO  
MOLECULE ALIGNMENT AND POPULATION INVERSION  
A66-37343

GIANT PULSE FORMATION THEORY, MEASURING SHAPE AND  
DURATION OF NEODYMIUM GLASS LASER PULSES FOR  
VARIOUS VALUES OF INVERSE POPULATION  
A66-37367

L-BAND TRAVELING WAVE MASER USING CHROMIUM DOPED  
RUTILE, DISCUSSING INVERTED SUSCEPTIBILITY AS  
FIGURE OF MERIT A66-38239

SPONTANEOUS EMISSION NOISE POWER ADDED TO  
AMPLIFIED SIGNAL IN LASER AMPLIFIER IN HE- XE GAS

- DISCHARGE AND SATURATION RELATION TO POPULATION INVERSION A66-38387
- SPONTANEOUS EMISSION IN INVERSELY POPULATED MEDIUM EXAMINED FOR UNIFORM RUBY ROD LASER WITH UNIFORM PUMPING DISTRIBUTION A66-41450
- BOOK ON LASERS COVERING OPTICAL CAVITIES, GAS LASERS, SOLID STATE LASERS, OPTICAL PUMPING, Q-SWITCHING, POPULATION INVERSION, ETC A66-42319
- SPECTROSCOPY OF IR EMISSION AND LASER OSCILLATION RESULTING FROM TRANSIENT POPULATION INVERSIONS ON ELECTRONIC TRANSITIONS IN MOLECULAR NITROGEN A66-42550
- SEMICONDUCTOR LASER TECHNOLOGY, OPERATING PRINCIPLES, MATERIAL PROPERTIES AND PERFORMANCE, WITH EMPHASIS ON GA AS JUNCTION LASERS A66-42802
- FORMULAS FOR ANALYZING CHARACTERISTICS OF SINGLE-PULSE Q-SWITCHING LASER AS FUNCTION OF POPULATION INVERSION, PUMPING POWER, MIRROR REFLECTIVITY, AND PROPERTIES OF MEDIUM TG-230-T473 N66-37256
- APPROXIMATE ABSOLUTE VALUES OF PUMPING POWER, THRESHOLD POWER AND CRITICAL EXCESS POPULATION FOR RUBY LASER DETERMINED FROM RELATIVE FLASH TUBE INTENSITY MEASUREMENTS A67-10245
- LASER CHARACTERISTICS OF NARROW BAND TYPE I SOLAR RADIO BURST AND MAGNETIC DIPOLE TRANSITIONS IN SPLIT ZEEMAN SUBLEVELS OF HYDROGEN ATOMS OF SOLAR CORONA IN GROUND LEVEL A67-11652
- FLUORESCENT EMISSION OF NEODYMIUM LASER TRIGGERED BY POKKELS EFFECT AS FUNCTION OF POPULATION INVERSION A67-13201
- POPULATION INVERSION OF UPPER LASER LEVEL OF CARBON DIOXIDE MOLECULES, NOTING ELECTRON-MOLECULE COLLISION AND EFFECT OF NEON ADDITION A67-13297
- SPONTANEOUS EMISSION IN INVERSELY POPULATED MEDIUM EXAMINED FOR UNIFORM RUBY ROD LASER WITH UNIFORM PUMPING DISTRIBUTION A67-14186
- POPULATION INVERSION OF UPPER LASER LEVEL OF CARBON DIOXIDE MOLECULES, NOTING ELECTRON-MOLECULE COLLISION AND EFFECT OF NEON ADDITION A67-14722
- TWO-LEVEL RESONATOR TYPE LASER USING NEUTRON-IRRADIATED QUARTZ SINGLE CRYSTAL WITH HIGH RECURRENT INVERSION FREQUENCY A67-15158
- POPULATION INVERSION VARIATION DURING LASER EMISSION AS SHOWN BY MEASUREMENTS OF FLUORESCENCE INTENSITY A67-15497
- ABRUPT TRANSMISSION CHANGE DURING RUBY LASER EMISSION RESULTING FROM PUMPING WITH XENON FLASH LAMP A67-15649
- GAS LASER PUMPED MICROWAVE EMISSION FOR PRODUCING CONTROLLED EXCITED STATE POPULATION FOR RF SPECTROSCOPY OF NEON A67-16638
- CHANGE IN BASIC BARRIER RELATION FOR HETEROJUNCTION COMPARED TO HOMOJUNCTION OF WIDE GAP EMITTER INJECTION LASER A67-17097
- GIANT PULSE FORMATION THEORY, MEASURING SHAPE AND DURATION OF NEODYMIUM GLASS LASER PULSES FOR VARIOUS VALUES OF INVERSE POPULATION A67-17876
- EFFECTS OF GAIN SATURATION BY STRONG TRAVELING FIELDS IN DILUTE LASER MEDIA, NOTING ATOMIC MOTION AND LINE BROADENING A67-20126
- POSITION ERROR  
ERROR DUE TO MULTIPLE PROPAGATION IN DISTANCE MEASUREMENT BY COMPARISON OF MODULATION PHASES ON TRANSMITTED AND REFLECTED LASER BEAM
- A67-19606
- POSITIONING  
SELECTIVE ACCESS LASER DISPLAY BEAM POSITIONER  
RAOC-TR-66-447 N67-15327
- POTASSIUM  
FREQUENCY SHIFT IN RESONANCE TRANSITION INDUCED IN POTASSIUM VAPOR BY RUBY LASER PULSE A66-25103
- FREQUENCY SHIFT IN RESONANCE TRANSITION INDUCED IN POTASSIUM VAPOR BY RUBY LASER PULSE A66-30282
- RESONANT BIREFRINGENCE IN POTASSIUM VAPOR UNDER INFLUENCE OF ELECTRIC FIELD OF RUBY LASER EMISSION A66-36066
- POTASSIUM COMPOUND  
NEODYMIUM DOPED YAG CRYSTAL AND LITHIUM META NIOBATE AS CW LASER MATERIALS AND POTASSIUM TANTALUM NIOBATE AS OPTICAL MODULATOR MATERIAL A66-25518
- INVERTED SUSCEPTIBILITY, INVERSION RATIO, LINE WIDTHS AND SPIN-LATTICE RELAXATION TIMES FOR MASER OPERATION POINT IN CHROMIUM-DOPED COBALT POTASSIUM CYANATE A66-30934
- POTASSIUM PHOSPHATE  
RUBY LASER-INDUCED EFFECT OF PULSED PRESSURE ON KDP CRYSTAL SURFACE AND THERMAL BULK EFFECT ON EXCITATION OF ULTRASONIC OSCILLATION IN CRYSTAL A66-40318
- POWER DENSITY  
BREAKDOWN BY NEODYMIUM GLASS LASER RADIATION IN ATOMIC AND MOLECULAR GASES, DETERMINING POWER DENSITIES, NOTING RELATION OF PRESSURE TO BREAKDOWN POWER A66-30938
- QUANTITATIVE PHOTOGRAPHIC DETERMINATIONS OF LASER BEAM POWER DENSITY DISTRIBUTIONS AND Q-SWITCHED RUBY OSCILLATOR-AMPLIFIER SYSTEM DIVERGENCE CHARACTERISTICS A66-41032
- POWER EFFICIENCY  
OPTICAL RESONATOR DIFFRACTION LOSS, NOTING LASER OSCILLATIONS IN HIGH LOSS ARRANGEMENTS, OUTPUT BEAM POWER, FIELD PATTERNS, ETC A66-25195
- MAXIMUM OUTPUT POWER APPROXIMATED FOR 6328 ANGSTROM HE- NE GAS LASER, NOTING OPTIMUM MIRROR TRANSMISSION AND LASER GEOMETRY A66-26571
- MATHEMATICAL MODEL OF GA AS INJECTION LASER APPLIED IN DETERMINING MAXIMUM OBTAINABLE POWER OUTPUT, USING RATE EQUATIONS OF ELECTRON AND PHOTON DENSITIES AND THERMAL RESISTANCE FOR OPTIMUM VALUE A66-26572
- GA AS SEMICONDUCTOR QUANTUM GENERATOR HEATING DURING INJECTION PULSE, ANALYZING TEMPERATURE EFFECT ON EXTERNAL QUANTUM OUTPUT AND GENERATOR EFFICIENCY A66-41621
- PULSED GAS DISCHARGE LASERS NOTING REQUIRED ENERGY LEVEL FOR MAXIMUM EFFICIENCY, EXPERIMENTAL TECHNIQUES AND RESULTS A67-16650
- TRAVELING WAVE RUBY LASER AS RADAR TRANSMITTER NOTING POWER GAIN, COHERENCE, FREQUENCY SHIFT AND SINGLE MODE OF OPERATION A67-16657
- POWER GAIN  
THEORETICAL EXISTENCE OF OPTIMUM PITCH GIVING MAXIMUM NET GAIN FOR TRAVELING WAVE MASERS, USING SLOW WAVE STRUCTURES A66-27958
- SPONTANEOUS EMISSION AND TRANSVERSE GAIN MEASUREMENTS IN GA AS INJECTION LASER AT 80 DEGREES K AND FOR 8466 ANGSTROM WAVELENGTH A66-28627
- GAIN FACTOR VARIATION WITH THRESHOLD CURRENT IN REFLECTIVE AND ANTIREFLECTIVE FILMS OF GA AS

- LASER WITH PHOTON AND CURRENT DENSITIES A66-38388
- INTRACAVITY INTERFEROMETER LASER MEASUREMENTS OF POWER GAIN AND OUTPUT IN SINGLE-FREQUENCY AR LASER AND 6328-ANGSTROM NE ISOTOPE SHIFT A66-40110
- TRANSVERSE GAIN AND SPONTANEOUS AND STIMULATED EMISSION AT 8466 ANGSTROMS IN GA AS STRUCTURES A66-42561
- I R GA AS LASER AMPLIFIER WITH GAINS AS HIGH AS 2000, OUTPUT POWERS OF 150 MW AND SATURATION OCCURRING WITH CURRENT INCREASE AT LOW LIGHT LEVELS A66-42562
- NONLINEAR ATTENUATION OR GAIN CHARACTERISTICS OF DOPPLER-BROADENED ATOMIC RESONANCE INVOLVING LEVELS WITH SMALL SPLITTINGS, NOTING MODE COUPLING OF GAS LASER A67-10152
- PARAMETRIC AMPLIFICATION OF FAR IR IN TE CRYSTAL PUMPED BY CARBON DIOXIDE LASER A67-13572
- SINGLE MODE OUTPUT POWER MODULATION ANALYSIS OF SATURATION AND GAIN OF GAS LASERS AND EFFECTS OF EXCITATION DENSITY MODULATION AND RESONATOR Q MODULATION A67-15111
- SINGLE MODE OUTPUT POWER MODULATION STUDY OF SATURATION AND GAIN OF GAS LASER A67-16686
- X-BAND RUBY MASER DESIGN WITH LIQUID HYDROGEN COOLING FOR HIGH GAIN AT LOW PUMPING POWER A67-19131
- POWER GENERATOR**  
POWER ENHANCEMENT IN PULSED HE- NE LASERS, NOTING OVERSHOOTING FOR RF DISCHARGE MODULATION WITH SQUARE WAVE A66-32963
- POWER SPECTRUM**  
PHOTOELECTRON EMISSION STATISTICS DETERMINING PROBABILITY DISTRIBUTION OF PHOTOELECTRON COUNTS IN PHOTOMULTIPLIER ILLUMINATED BY LASER BELOW AND ABOVE THRESHOLD OF OSCILLATION A66-42543
- LINEARIZED POPULATION RATE EQUATIONS AND QUANTUM NOISE SOURCES USED TO CALCULATE SPECTRA OF INTRINSIC SECOND MOMENT INTENSITY FLUCTUATIONS IN 3- AND 4-LEVEL CW LASER OSCILLATORS A66-42548
- INTENSITY DEPENDENT FREQUENCY SHIFT IN SPECTRAL OUTPUT OF MONOCHROMATIC GIANT PULSE LASERS MEASURED, USING FABRY- PEROT INTERFEROMETER A67-10251
- POWER SUPPLY**  
PERIODIC UNDAMPED OSCILLATIONS IN POWER INTENSITY OF TWO-MODE OPTICAL MASER A66-26217
- POWER TRANSMISSION**  
SATURABLE DYES NOTING MODE SELECTION PROPERTIES AND ABSORPTION SPECTRA IN BLEACHED STATE A66-42253
- CURRENT MEASURING DEVICE FOR EHV TRANSMISSION LINE, OBTAINING INSTANTANEOUS MAGNETIC FIELD BY GAUGING FARADAY ROTATION ANGLE OF LASER BEAM IN FLINT GLASS ROD A66-42556
- PLASMA PROPERTIES USING LASERS AND SPECTROSCOPY - TRANSMISSION DESIGN REQUIREMENTS FOR AIRCRAFT GAS TURBINES N66-27060
- PRESSURE EFFECT**  
HELIUM-NEON GAS LASER USED TO STUDY PRESSURE EFFECT ON LINE SHAPE OF 2S-2P OPTICAL TRANSITIONS OF NEON EXCITED STATES A66-26198
- PRESSURE EFFECTS IN FABRY- PEROT LOSSY-CAVITY GAS LASER OUTPUT A66-26199
- BREAKDOWN BY NEODYMIUM GLASS LASER RADIATION IN ATOMIC AND MOLECULAR GASES, DETERMINING POWER DENSITIES, NOTING RELATION OF PRESSURE TO
- BREAKDOWN POWER A66-30938
- PHOTODISSOCIATION LASER SYSTEM, DISCUSSING OUTPUT ENERGY DEPENDENCE ON PRESSURE, TEMPERATURE AND NUMBER OF SUCCESSIVE OPTICAL PUMPING FLASHES A66-37781
- PULSED COAXIAL TRANSMISSION LINE NITROGEN GAS LASER, NOTING PRESSURE EFFECT A66-40107
- RUBY LASER-INDUCED EFFECT OF PULSED PRESSURE ON KDP CRYSTAL SURFACE AND THERMAL BULK EFFECT ON EXCITATION OF ULTRASONIC OSCILLATION IN CRYSTAL A66-40318
- SPECTRAL ANALYSIS OF LASER DISCHARGE IN PURE AND IMPURE HE, OBTAINING SPECTRA OF SPARK AT VARIOUS PRESSURES, DETERMINING ELECTRON CONCENTRATION AT VARIOUS STAGES A66-40946
- GAS PUMPING EFFECT ON OUTPUT OF REPETITIVELY PULSED ION LASERS A66-42569
- DOPPLER AND IMPACT BROADENING OF SPECTRAL LINES AND PRESSURE EFFECTS ON POWER OUTPUT OF GAS LASER A67-16643
- ENHANCED LASING OF HIGH PRESSURE HE- NE LASER, COMMENTING ON DELAY TIME OF LIGHT PULSE EMITTING THROUGH WALLS OF DISCHARGE TUBE FROM START OF EXCITING PULSE A67-16687
- PRESSURE DEPENDENCE OF OUTPUT POWER OF HE- NE LASER ON AMPLITUDE OF PERIODIC HIGH VOLTAGE EXCITATION PULSES A67-18784
- PRESSURE MEASUREMENT**  
PULSED LASER ACTION IN VISIBLE SPECTRUM OF SINGLY IONIZED GE, SN, PB, IN, CD AND ZN, LISTING TEMPERATURE AND PRESSURE RANGES A66-36076
- PRISM**  
POLARIZING PROPERTIES OF LASER REFLECTOR CONSISTING OF TWO IDENTICAL RECTANGULAR PRISMS A66-31803
- POLARIZING PROPERTIES OF LASER REFLECTOR CONSISTING OF TWO IDENTICAL RECTANGULAR PRISMS A66-39105
- DISTRIBUTION OF PUMPING RADIATION DENSITY IN TRIHEDRAL PRISM LASER RESONATOR BY GEOMETRICAL OPTICS TG-230-T476 N66-34774
- DYNALENS OPTICAL ELEMENT CHARACTERIZED BY VARIABLE-GEOMETRY FLUID PRISM THAT DEFLECTS BEAM OF LIGHT OR ELECTROMAGNETIC ENERGY A67-11132
- RUBY LASER GENERATION FROM TWO R LINES BY PRISMATIC LIGHT DISPERSION IN RESONATOR A67-13095
- PRISMATIC BAR**  
LASER OSCILLATION WITH TOTALLY REFLECTING ROOF PRISM AS CAVITY, NOTING OUTPUT VS MIRROR ALIGNMENT FOR TWO ROTATION AXES A66-29414
- PROBABILITY DENSITY**  
STATISTICAL ANALYSIS OF LIGHT FIELDS CREATED BY SUPERPOSITION OF LASER LIGHT AND CHAOTIC LIGHT A66-29815
- PROBABILITY DISTRIBUTION**  
NEAR- BOSE- EINSTEIN PROBABILITY DISTRIBUTION OF PHOTOELECTRON COUNTS PRODUCED BY HE- NE GAS LASER NARROW BAND GAUSSIAN LIGHT SOURCE OPERATING SLIGHTLY BELOW OSCILLATION THRESHOLD A66-30645
- STATISTICAL DISTRIBUTION OF AM LASER SIGNAL ENVELOPE UPON PASSAGE THROUGH TURBULENT ATMOSPHERE A67-13988
- PROBABILITY THEORY**  
PROBABILITY METHOD OF DETERMINING ENERGY LOSSES IN RUBY LASER WITH MISALIGNED RESONATORS

FTD-HT-66-492 N67-19235

**PRODUCTION ENGINEERING**  
 PRODUCTION ENGINEERING MEASURE TO IMPROVE CRYSTAL  
 QUALITY AND PRODUCTION YIELD OF RUBY LASER  
 CRYSTAL GROWTH QPR-2 N66-30291

**LASERS AND RCA** A67-19080

PRODUCTION ENGINEERING MEASURE FOR RUBY LASER  
 RODS QPR-3 N67-15107

**PROGRAM MANAGEMENT**  
 PROGRAM PLANNING, GROUND SUPPORT AND AIRBORNE  
 EQUIPMENT FOR LASER SPACE COMMUNICATION SYSTEM  
 NASA-CR-78855 N66-39446

PROGRAM SPECIFICATIONS FOR LASER SPACE  
 COMMUNICATION STUDY NASA-CR-78856 N66-39447

PROGRAM PLANNING TO DETERMINE ATMOSPHERIC EFFECTS  
 ON LASER SPACE-GROUND COMMUNICATION SYSTEM  
 NASA-CR-78854 N66-39448

**PROPAGATION**  
 EXPERIMENT SPECIFICATIONS FOR DETERMINING  
 ATMOSPHERIC EFFECTS ON LASER PROPAGATION  
 NASA-CR-79094 N66-39992

**PROPAGATION MODE**  
 THEORY OF STEADY MULTIMODE OSCILLATION OF SOLID  
 STATE LASER EXTENDED TO CAVITIES WITH INEFFICIENT  
 END MIRRORS OR LOSSES DEPENDENT ON FREQUENCY  
 A66-41274

HIGH MAGNETIC FIELD EFFECT ON INTERBAND  
 SEMICONDUCTOR LASER, PARTICULARLY ELECTROMAGNETIC  
 MODES AND COUPLING AND THRESHOLD CURRENT  
 CONDITIONS A67-16673

ERROR DUE TO MULTIPLE PROPAGATION IN DISTANCE  
 MEASUREMENT BY COMPARISON OF MODULATION PHASES ON  
 TRANSMITTED AND REFLECTED LASER BEAM  
 A67-19606

**PROPAGATION VELOCITY**  
 PROPAGATION RATE OF HIGH POWER LASER LIGHT PULSE  
 IN INVERSELY POPULATED MEDIUM A66-29980

**PROPULSION SYSTEM**  
 INTERSTELLAR VEHICLE PROPELLED BY TERRESTRIAL  
 LASER BEAM A66-35488

**PSEUDORANDOM SIGNAL**  
 LASER RADAR RANGING SYSTEM USING PSEUDORANDOM CODE  
 MODULATION, CONSIDERING APPLICATION TO PULSE AND  
 DIGITAL CIRCUITRY, STATISTICAL COMMUNICATION  
 THEORY AND ELECTRO-OPTICAL ENGINEERING  
 A66-33557

**PULSE AMPLITUDE**  
 RUBY LASER EXPERIMENT YIELDING GIANT PULSES BY  
 SEPARATING MIRRORS FROM CRYSTALS A66-25684

LASER INDUCED SPONTANEOUS ELECTRON EMISSION FROM  
 REAR SIDE OF METAL FOILS, NOTING ELECTRON ENERGY  
 VS LASER ENERGY PULSE MAGNITUDE, ETC  
 A66-31536

GIANT PULSE FORMATION THEORY, MEASURING SHAPE AND  
 DURATION OF NEODYMIUM GLASS LASER PULSES FOR  
 VARIOUS VALUES OF INVERSE POPULATION  
 A66-37367

NONLINEAR AMPLIFICATION OF LIGHT PULSE PASSING  
 THROUGH LASER OPERATING AT SATURATION REGIME  
 A66-39542

NARROW BEAM DIVERGENT Q-SWITCHED LASER PULSE  
 GENERATION, NOTING OUTPUT CHARACTERISTICS AND  
 APPLICATIONS A67-11024

GIANT PULSE FORMATION THEORY, MEASURING SHAPE AND  
 DURATION OF NEODYMIUM GLASS LASER PULSES FOR  
 VARIOUS VALUES OF INVERSE POPULATION

A67-17876

**PULSE AMPLITUDE MODULATION /PAM/**  
 TRANSITION TO DETONATION IN GASEOUS MEDIUM  
 EXPERIMENTALLY STUDIED, BASED ON SELF-SUSTAINED  
 DETONATION FRONT AND ADAPTATION OF AMPLITUDE  
 MODULATED GIANT PULSE LASER SYSTEM  
 A67-13500

**PULSE CODE MODULATION /PCM/**  
 OPTICAL MODULATOR USING ELECTRO-OPTIC EFFECT IN  
 LITHIUM TANTALATE FOR PCM TRANSMISSION SYSTEMS  
 OPERATING AT 224 MEGACYCLE BIT RATE  
 A67-10013

**PULSE DURATION**  
 SHORT PULSE Q-SWITCHED LASER WITH VARIABLE PULSE  
 LENGTH A67-16641

**PULSE MODULATION**  
 HELIUM-NEON LASER MODULATION BY POSITIVE AND  
 NEGATIVE VOLTAGE PULSES A66-31559

EXPERIMENTAL STUDY OF EMISSION CONTROL IN RUBY  
 LASER USING DIFFRACTION MODULATOR WITH MODULATED  
 TRAVELING ULTRASONIC WAVE A66-33516

EXPERIMENTAL STUDY OF EMISSION CONTROL IN RUBY  
 LASER USING DIFFRACTION MODULATOR WITH MODULATED  
 TRAVELING ULTRASONIC WAVE A66-42129

COHERENT AND NONCOHERENT SEMICONDUCTOR LASERS FOR  
 DEVELOPMENT OF FREQUENCY- AND PULSE-MODULATED  
 COMMUNICATIONS SYSTEMS  
 ESD-TDR-65-232 N66-25513

PULSED LASER Q-FACTOR MODULATION USING NONLINEAR  
 RESONATOR FUNCTIONS IN ABSORBING MEDIUM  
 A67-13135

EQUATION FOR DYNAMICAL BEHAVIOR OF LASER, SOLVING  
 CASE OF DEEP MODULATION OF OUTPUT, NOTING  
 PULSATION PROBLEMS A67-16662

**PULSE RADAR**  
 GALLIUM ARSENIDE DIODE LASER AS PULSED IR SOURCE  
 FOR EXPERIMENT AND DESIGN CONSIDERATIONS FOR RADAR  
 INDICATION OF CLOUD HEIGHT AND VISIBILITY  
 A66-33616

**PULSE RATE**  
 LASER PRODUCING TWO OR THREE LIGHT PULSES IN  
 SEQUENCE WITH INTERVAL BETWEEN PULSES MECHANICALLY  
 CONTROLLED BY OPTICAL WEDGE INSERTED INTO  
 RESONATOR A66-25322

LASER PRODUCING TWO OR THREE LIGHT PULSES IN  
 SEQUENCE WITH INTERVAL BETWEEN PULSES MECHANICALLY  
 CONTROLLED BY OPTICAL WEDGE INSERTED INTO  
 RESONATOR A67-10161

**PULSE TRANSMISSION SYSTEM**  
 SINGLE SELF-MODE-LOCKED PULSE SELECTION FROM  
 BLEACHABLE DYE Q-SWITCHED ND-DOPED GLASS LASER  
 A67-10875

**PULSE WIDTH**  
 OPTICAL SPECTRA OF ULTRASHORT OPTICAL PULSES  
 GENERATED BY MODE-LOCKED GLASS-DOPED NEODYMIUM  
 LASERS, CONSIDERING SATURABLE ABSORBER CELL PLACED  
 PARALLEL TO FABRY-PEROT REFLECTOR  
 A66-39115

PICOSECOND LASER PULSE WIDTHS MEASUREMENT BY  
 METHOD USING SPECIAL SYMMETRY PROPERTIES OF SECOND  
 HARMONIC GENERATION AT GA AS CRYSTAL SURFACE  
 A67-20097

**PULSED DOPPLER SYSTEM**  
 DOPPLER LASER RADAR SYSTEM FOR DETECTION OF CLEAR  
 AIR TURBULENCE  
 SID-66-450 N66-35122

**PULSED GENERATOR**  
 GIANT COHERENT LIGHT PULSE GENERATION BY Q-  
 FACTOR-MODULATED LASER  
 A66-31183

PULSE GENERATOR FOR DRIVING SEMICONDUCTOR LASER  
 DIODE, NOTING CIRCUIT DIAGRAM AND OPERATING



- CHARACTERISTICS A66-37588
- MULTIPURPOSE ULTRAHIGH SPEED CAMERA SYSTEM, NOTING USE AS MONOSECOND KERR CELL, IMAGE CONVERTER AND GIANT LASER PULSE GENERATOR A66-41675
- MERCURY WETTED RELAY PULSE GENERATOR AND PULSE TRANSFORMER TO DRIVE GALLIUM ARSENIDE LASERS IN FAST PULSE MODE HDL-TM-66-3 N66-34246
- GIANT COHERENT LIGHT PULSE GENERATION BY Q-FACTOR MODULATED LASER A67-12941
- PULSED LASER
- SEGMENTED-ROD RUBY LASER STRUCTURE OPERATED AS GIANT PULSE LASER, USING KERR CELL TO PROVIDE Q-SWITCHING, NOTING NUMBER OF OSCILLATING MODES A66-25038
- RUBY LASER AMPLIFIER DYNAMICS, NOTING AMPLIFICATION IN ENERGY GAIN REGIMES AND CORRELATION TO THEORETICAL EQUATIONS A66-25049
- FORMATION OF ULTRASONICALLY GATED GIANT LASER PULSES BY Q-SPOILING, NOTING PHOTOGRAPHS OF RUBY AND ROLE OF CAVITATION IN GATING MECHANISM A66-25057
- FREQUENCY SHIFT IN RESONANCE TRANSITION INDUCED IN POTASSIUM VAPOR BY RUBY LASER PULSE A66-25103
- LASER PRODUCING TWO OR THREE LIGHT PULSES IN SEQUENCE WITH INTERVAL BETWEEN PULSES MECHANICALLY CONTROLLED BY OPTICAL WEDGE INSERTED INTO RESONATOR A66-25322
- NONLINEAR DIELECTRIC LASER LIGHT ABSORPTION BY NEUTRAL GAS RESULTING IN AVALANCHE BREAKDOWN OF GAS DUE TO THERMAL IONIZATION A66-25425
- SECOND HARMONIC GENERATION BY Q-SWITCHED LASER PULSE FROM SILICON AND GERMANIUM SURFACES A66-26150
- DISCREPANCY BETWEEN CALCULATED AND EXPERIMENTAL VALUES FOR RAMAN GAIN IN PULSED LASER SUGGESTS HIGHER ENERGY DISTRIBUTION DUE TO LIGHT TRAPPING OR BRILLOUIN SCATTERING A66-26157
- MULTIPLE STIMULATED BRILLOUIN EMISSION EXHIBITED BY LIQUIDS EXPOSED TO PULSED RUBY LASER, NOTING SCATTERING EVENTS, STOKES ORDERS IDENTIFICATION AND ITERATION MECHANISM A66-26164
- PHOTON ECHO, OPTICAL ANALOG OF SPIN ECHO, IN RUBY CRYSTALS, USING RUBY LASER AS EXCITATION SOURCE A66-26170
- Q-SWITCHED LASERS, INTERACTION OF HIGH POWER LIGHT PULSE WITH MATTER AND SEMICONDUCTOR LASERS PUMPED WITH OPTICAL RADIATION AND ELECTRON BEAMS INVESTIGATED, USING QUANTUM OSCILLATOR AND AMPLIFIER A66-26180
- THRESHOLD DATA FOR RUBY AND NEODYMIUM LASER PULSE-INDUCED BREAKDOWN IN Xe, Ar, Kr, Ne, He, OXYGEN, NITROGEN, AIR AND CARBON DIOXIDE A66-26191
- PLASMA RESONANCE AND SCATTERING, THRESHOLD VARIATION AND OPTICAL REFLECTIVITY IN PULSED LASER BEAM-INDUCED GAS BREAKDOWN A66-26192
- GIANT-PULSE LASER-INDUCED ATMOSPHERIC ELECTRIC BREAKDOWN CAUSING OPTICAL FREQUENCY DISCHARGE A66-26194
- ELECTRON IMPACT EXCITATION MECHANISM OF ARGON-ION CONTINUOUS AND LONG PULSE LASERS A66-26206
- HIGH RESOLUTION PIEZOELECTRICALLY SCANNED FABRY-PEROT INTERFEROMETER USED TO STUDY GAIN PROFILES, MODE STRUCTURES AND EMISSION LINE WIDTHS OF CW Ar, Kr AND Xe ION LASERS AND Hg-He PULSED LASER A66-26208
- ABSOLUTE FLUX MEASUREMENT FOR PULSED AND TRIGGERED LASERS REQUIRING ONLY QUANTUM RECEIVERS A66-26375
- ABSORBER RELAXATION EFFECT ON PASSIVE Q-SWITCH PULSE LASER A66-27029
- LIGHT PULSE SHAPE VARIATION OF LASER WITH MODULATED Q-FACTOR DURING NONLINEAR AMPLIFICATION A66-27183
- LIGHT DETECTION AND RANGING / LIDAR/ TECHNIQUE USE IN ATMOSPHERIC RESEARCH, PARTICULARLY METEOROLOGICAL FACTORS IMPORTANT TO AVIATION AND ROCKET OPERATIONS AIAA PAPER 65-464 A66-27892
- PERFORMANCE OF TWO-PHOTON LASER OPERATING IN CONTINUOUS WAVE MODE, DERIVING FORMULA FOR PULSE FREQUENCY A66-28166
- DAMAGE THRESHOLDS FOR VARIOUS GLASSES EXPOSED TO LASER PULSES, EMPHASIZING INTERNAL DAMAGE A66-28732
- C AT DETECTION FROM DOPPLER SHIFT IN LASER LIGHT BACKSCATTERED FROM ATMOSPHERIC AEROSOL A66-28930
- MARK I SMASER DESIGN, SUBMILLIMETER WAVE GAS LASER CAPABLE OF CONTINUOUS WAVE OR PULSE OPERATION A66-29009
- EXPERIMENTAL EVIDENCE OF INVERSE BREMSSTRAHLUNG AND ELECTRON-IMPACT IONIZATION IN LOW PRESSURE ARGON IONIZED BY GIANT PULSE LASER A66-29115
- PULSED NITROGEN LASER ACTION IN WIND TUNNEL-SIMULATED SUPERSONIC FLOW A66-29384
- ULTRASHORT OPTICAL PULSES GENERATED BY MODE LOCKING CONTINUOUS NEODYMIUM DOPED YTTRIUM-ALUMINUM GARNET LASER A66-29391
- PULSED LASER OPERATION IN WEDGE-SHAPED RUBY ROD AT ROOM TEMPERATURE A66-29415
- MEASURING DEVICE FOR PULSED LASER OUTPUT POWER USING BOLTMETER, AMPLIFIER AND OSCILLOSCOPE A66-29701
- TIME CHARACTERISTICS IN GENERATION OF GIANT LASER PULSE STUDIED BY CIRCUIT WITH PRISMATIC SHUTTERS A66-29702
- DYNAMICS OF FIELD AND GENERATION FREQUENCIES IN GIANT PULSE OF RUBY LASER WITH PASSIVE SHUTTER, USING SOLUTION OF CRYPTOCYANINE IN ETHANOL, NOTING MIRROR REFLECTION COEFFICIENT A66-29727
- PROPAGATION RATE OF HIGH POWER LASER LIGHT PULSE IN INVERSELY POPULATED MEDIUM A66-29980
- SCATTERING OF LIGHT FROM PULSED RUBY LASER BY PLASMA JET, NOTING CROSS SECTION, ELECTRON-PHONON INTERACTION, ETC A66-30139
- FREQUENCY SHIFT IN RESONANCE TRANSITION INDUCED IN POTASSIUM VAPOR BY RUBY LASER PULSE A66-30282
- WRITING RATE OF ROTATING-MIRROR STREAK CAMERA DETERMINED, USING Q-SWITCHED LASER TECHNIQUE A66-30419
- RESONATOR TRANSIENTS USED TO SHORTEN GIANT LIGHT PULSES GENERATED IN Q-SWITCHED LASER OSCILLATORS TO PUMP SECONDARY LASER OSCILLATOR WITH SUITABLE ABSORPTION BAND A66-31077
- TIME RESOLUTION OF LASER-INDUCED ELECTRON EMISSION FROM CESIUM DIODE AT HIGH LASER POWER A66-31135
- GIANT PULSES FROM NEODYMIUM GLASS LASER PUMPED BY GIANT PULSES FROM RUBY LASER A66-31354
- HIGH VOLTAGE PULSED ELECTRODELESS DISCHARGE IN

- RARE GAS AS LIGHT SOURCE FOR RUBY AND ND GLASS LASER EXCITATION AND OBSERVATION OF OUTPUT CHARACTERISTICS A66-31448
- LASER CAVITY OUTPUT OPTIMIZATION FOR MAXIMUM EXTERNAL QUANTUM EFFICIENCY SHOWING DEPENDENCE ON LENGTH AND REFLECTIVITY FOR GIVEN CURRENT DENSITY A66-31535
- CHORIORETINAL LESION PRODUCED BY PULSED RUBY LASER BEAM AND COMPLEX CHANGES IN RETINAL EXCITABILITY IN CATS A66-31761
- FOCUSED LASER COHERENT RADIATION-INDUCED DEGRADATION OF SOLID METHYLENE AND GAS CHROMATOGRAPHIC ANALYSIS OF REACTION PRODUCTS A66-31870
- FREQUENCY SHIFT RELATIVE TO SPECTRAL WIDTH FOR SINGLE PULSES OF TRIGGERED LASER DETERMINED BY MEASURING VARIATIONS OF EMITTED WAVELENGTH AS FUNCTION OF TIME A66-32622
- STIMULATED BRILLOUIN SCATTERING FROM NITROGEN AND METHANE USING GIANT PULSE LASER, NOTING CONVERGENCE ANGLE OF BACKSCATTERED BEAM SOUND, VELOCITY MEASUREMENT, ETC A66-32627
- ELECTRON-ION EMISSION PATTERN DISTRIBUTION OBTAINED BY PULSED LASER FOCUSING ON SOLID TARGET A66-33256
- LOW THRESHOLD NEODYMIUM GLASS LASER OSCILLATOR WITH HIGH REPETITION A66-33325
- MODE CHARACTERISTICS OF SOLID STATE LASERS FROM ANALYTICAL SOLUTION OF CONSERVATIVE EQUATION A66-33839
- DISINTEGRATION OF ALKALI HALIDE SINGLE CRYSTALS, POLYMERS AND GLASSES UNDER LASER RADIATION, NOTING PARAMETERS OF DISINTEGRATION REGION MAGNITUDE A66-34681
- FARADAY ROTATION OBTAINED WITH PULSED HIGH-FIELD MAGNETS FOR CONTROLLING LASER CAVITIES A66-35380
- MOMENTUM TRANSFER CAUSED BY FOCUSING LASER GIANT PULSE ON SURFACE IN VACUUM INVESTIGATED FOR BE, C, AL, ZN, AG AND W A66-35418
- ALUMINA HIGH TEMPERATURE GAS DISCHARGE TUBE FOR INVESTIGATION OF PULSED METAL VAPOR LASER OSCILLATIONS A66-35810
- LASER OUTPUT ENERGY CONTROLLER HAVING EIGHT-TO-ONE IMPROVEMENT IN PULSE REPEATABILITY IN SOLID STATE LASERS A66-36034
- LASER GIANT PULSE DAMAGE TO DIELECTRIC MIRROR COATINGS IMMERSSED IN NITROBENZENE SOLUTION A66-36075
- PULSED LASER ACTION IN VISIBLE SPECTRUM OF SINGLY IONIZED GE, SN, PB, IN, CD AND ZN, LISTING TEMPERATURE AND PRESSURE RANGES A66-36076
- PULSED DISCHARGES OF OCS MOLECULAR LASER A66-36080
- PLASMA PRODUCTION BY FIRING GIANT PULSE LASER AT SOLID DEUTERIUM PELLETS /ICE/, NOTING STRONG ANISOTROPY IN PLASMA OUTBURST A66-36595
- PULSED RUBY LASERS, CONSIDERING PUMPING AND THRESHOLD, OUTPUT, QUANTUM MECHANICS AND VARIATION ON BASIC DEVICE A66-36968
- FLUORESCENCE OF RARE EARTH, ACTINIDE AND TRANSITION METAL IONS IN INSULATING CRYSTALS AS RESULT OF OPTICAL EXCITATION, DISCUSSING SPECTROSCOPIC PROPERTIES AND OPERATING CHARACTERISTICS A66-36969
- FREQUENCY SPECTRUM OF LASER IMPULSE IN Q-SWITCHING REGIME WIDER THAN THAT OF SINGLE IMPULSE RADIATED BY LASER IN ORDINARY REGIME A66-37141
- FREQUENCY DOUBLING IN RESONANCE LASER, OBTAINING SECOND HARMONIC FIELD FOR LASER RADIATION BY GIANT PULSES A66-37144
- THRESHOLD DETERMINATION OF PULSED RUBY LASER BY SINGLE PULSE TECHNIQUE A66-37548
- IDENTIFICATION OF NUMBER OF LINES AT 11 MICRONS EMITTED FROM PULSED CARBON DIOXIDE LASER AS P BRANCH OF CARBON DIOXIDE VIBRATIONAL TRANSITION A66-37629
- PULSED OPERATION OF ELECTRON-BEAM PUMPED ZINC OXIDE LASER EMITTING RADIATION IN UV AT VERY LOW TEMPERATURES, NOTING IMPORTANCE OF USE OF CAVITY A66-37768
- MIRROR DAMAGE ALLEVIATION IN GIANT PULSE SEMICONDUCTOR LASER OPERATION, DISCUSSING USE OF HIGH MELTING POINT MIRRORS COOLING AND OBLIQUE INCIDENCE A66-38245
- PULSED NITROGEN LASER DELIVERING HIGH AVERAGE POWER WITHOUT COMPLICATIONS OF CONVENTIONAL Q-SWITCHING A66-38266
- PLASMA FLOW VELOCITY PROFILE MEASUREMENT BY ELECTROSTATIC PROBE DETECTION OF PLASMA DROP CAUSED BY GAS BREAKDOWN DUE TO FOCUSED GIANT PULSE LASER A66-38395
- PULSED-MODE GAIN CHARACTERISTICS IN NEODYMIUM-DOPED SILICATE GLASS LASER EXPERIMENTALLY RELATED TO GIANT-PULSE LASER ENERGY OUTPUT A66-38396
- ENERGIES OF IONS GENERATED FROM METAL SURFACE IRRADIATED BY SINGLE GIANT PULSE LASER A66-38412
- LASER VAPORIZATION AND IONIZATION OF SOLID MATERIALS TO OBTAIN IONS FOR TIME-OF-FLIGHT MASS SPECTROMETER A66-39385
- NONLINEAR AMPLIFICATION OF LIGHT PULSE PASSING THROUGH LASER OPERATING AT SATURATION REGIME A66-39542
- SINGLE PULSE OPERATION OF LASERS, NOTING ENERGY STORAGE AND AMPLIFICATION EFFECT FOR FOUR- AND THREE-LEVEL ACTIVE MEDIUM A66-39711
- SPECTRAL AND TIME-DEPENDENT CHARACTERISTICS OF STIMULATED RADIATION FROM RUBY PULSE LASER, USING FABRY-PEROT ETALON IN FINE-STRUCTURE OBSERVATION A66-39823
- PULSED COAXIAL TRANSMISSION LINE NITROGEN GAS LASER, NOTING PRESSURE EFFECT A66-40107
- ROOM TEMPERATURE PERFORMANCE OF GaAs LASER DIODES, USING SCRS TO ACHIEVE HIGH PULSE REPETITION RATE A66-40175
- PULSED INDUCED EMISSION IN HYDROGEN BEAM LASER FOR CASE OF TWO RELAXATION TIMES, DETERMINING POLARIZATION ONLY BY NUMBER OF ACTIVE PARTICLES IN RESONATOR A66-41091
- GAS DISCHARGE BY LASER PULSE, TAKING INTO ACCOUNT PHOTOIONIZATION DUE TO ELECTRON IMPACT A66-41094
- INTERNAL SELF-DAMAGE IN 25 MW RUBY LASER OSCILLATOR ROD A66-41160
- PERFORMANCE CHARACTERISTICS FOR PULSE TYPE AR LASER WITH EXTERNAL INTERFERENTIAL SYSTEM OF QUASI-CONFOCAL SPHERICAL MIRRORS A66-41452
- SCHLIEREN PHOTOGRAPHS OF PLASMA DISCHARGES IN PARALLEL PLATE RAIL TUBE, USING PULSED RUBY LASER AS LIGHT SOURCE A66-41510
- RUBY LASER GIANT PULSE OFF-AXIAL MODES DETECTED WITH HIGH RESOLUTION SPHERICAL FABRY-PEROT

- INTERFEROMETER A66-41627
- Q-SWITCH PULSED RUBY LASER IRRADIATION-INDUCED  
CHEMICAL DISSOCIATION AND IONIZATION IN RESIDUAL  
GASES A66-42076
- ABSORBER CONCENTRATION EFFECT ON PULSED LASER  
SYSTEM NOTING PERFORMANCE CHARACTERISTICS,  
THRESHOLD ENERGY, PUMPING DYNAMICS AND TIME  
PARAMETERS A66-42254
- Q-SWITCHING LASER SYSTEM TO OBTAIN SIMULTANEOUS  
GIANT PULSES FROM FIVE RUBY LASER OSCILLATORS  
A66-42302
- GIANT PULSE GENERATION RANGE IN TRANSVERSE  
DIRECTION AFTER Q-SWITCHING IN RUBY LASER,  
EXAMINING RESONATOR PROPERTIES A66-42516
- MODE SELECTION, RELAXATION OSCILLATIONS, MODE  
INTERACTION AND THERMAL EFFECTS IN ROOM  
TEMPERATURE CW LASERS IN ELLIPSOIDAL PUMPING  
SYSTEMS A66-42546
- PULSED RUBY LASER PHOTOELECTRIC RECEIVER  
EXPERIMENTS DETERMINING SATELLITE ORBITS,  
SUPPLEMENTING BAKER-NUNN CAMERA NETWORK  
A66-42547
- PULSED LASER HOLOGRAPH AND PROBLEM OF  
OVERCOMING LIMITED COHERENCE A66-42560
- GAS PUMPING EFFECT ON OUTPUT OF REPETITIVELY  
PULSED ION LASERS A66-42569
- NARROW SPECTRAL OUTPUTS FROM ACTIVELY Q-SWITCHED  
LASERS, DERIVING FRACTIONAL ENERGY EXPRESSION FOR  
INJECTED MODE GROUP A66-42570
- LIGHT PULSE SHAPE VARIATION OF LASER WITH  
MODULATED Q-FACTOR DURING NONLINEAR AMPLIFICATION  
A66-42727
- GAS-DISCHARGE CW LASERS, PARTICULARLY HE- NE,  
CARBON DIOXIDE, ARGON-ION AND PULSED SELF-  
TERMINATING LASERS, DISCUSSING CLASSIFICATION,  
POWER OUTPUT AND GAIN, DOPPLER WIDTH, COHERENCE  
AND NOISE A66-42801
- DETECTING CONCENTRATION OF NITRIC OXIDE IN  
METASTABLE STATE IN UPPER ATMOSPHERE, USING GIANT-  
PULSE RAMAN LASER SOURCES A66-43022
- HIGH TEMPERATURE PLASMAS PRODUCED BY LASER HEATING  
TID-22132 N66-25340
- RUBY LASER WHICH PRODUCES TRIGGERABLE GIANT LASER  
PULSES BY Q-SWITCHING WITH SELECTIVE SATURABLE  
ORGANIC DYE IPP-4/34 N66-28336
- ION CURRENT PRODUCED BY ILLUMINATING MATERIALS  
WITH FOCUSED OUTPUT OF PULSED RUBY LASER  
NASA-CR-54154 N66-28382
- PULSED RUBIDIUM LASER RANGE MEASUREMENTS WITH  
DELAYED SWEEP OSCILLOSCOPE, AND WITH DIGITAL  
READOUT SYSTEM N66-32075
- OPTICAL SATELLITE TRACKING ANALYSIS USING PULSED  
LASER REFLECTION N66-32076
- DOUBLE PULSE PUMPING OF RUBY LASERS FOR  
IMPROVEMENT OF LASER PERFORMANCE AND EFFICIENCY  
SA-TR20-9301 N66-35622
- GIANT PULSE LASER WITH HIGH REPETITION RATE FOR  
OPTICAL RANGING SYSTEMS NSF-P-9 N66-36248
- FORMULAS FOR ANALYZING CHARACTERISTICS OF SINGLE-  
PULSE Q-SWITCHING LASER AS FUNCTION OF  
POPULATION INVERSION, PUMPING POWER, MIRROR  
REFLECTIVITY, AND PROPERTIES OF MEDIUM  
TG-230-T473 N66-37256
- RUBY LASER MODE SELECTION AND PULSE AMPLIFICATION  
IPP-4/49 N66-38698
- LASER PRODUCING TWO OR THREE LIGHT PULSES IN  
SEQUENCE WITH INTERVAL BETWEEN PULSES MECHANICALLY  
CONTROLLED BY OPTICAL WEDGE INSERTED INTO  
RESONATOR A67-10161
- Q-SWITCHING OF RUBY LASER USING CELL CONTAINING  
CHLOROALUMINUM PHTHALOCYANINE IN CHLORONAPHTHALENE  
TO OBTAIN GIANT PULSES A67-10448
- LASER LINES OF PULSED DISCHARGE IN IODINE VAPOR  
A67-10549
- MOLECULAR SPECTROSCOPY OF ILLUMINATION EFFECTS ON  
COBALT ACTIVATED ZN S EXPOSED TO RUBY LASER  
PULSES A67-10683
- INTENSE PULSE GENERATION AT 5300 ANGSTROMS BY  
FREQUENCY DOUBLING IN Q-SWITCHED AND GLASS LASER  
AND POSSIBILITY OF GENERATING PARTICULAR HARMONICS  
A67-10759
- LASER LINES OF PULSED DISCHARGE IN IODINE  
VAPOR A67-11057
- ORGANIC GLASS DISINTEGRATION INDUCED BY PULSED  
LASER BEAMS A67-12241
- LASER INDUCED BREAKDOWN OF COMPLEX ORGANIC  
MOLECULES IN VAPOR STATE, NOTING EMISSION  
ACCOMPANIED BY FORMATION OF PARTIALLY  
DISSOCIATED HOT GAS A67-12451
- PUMPING OF ORGANIC DYES IN ORGANIC SOLVENTS, USING  
PULSED RUBY LASER A67-12515
- AVALANCHE TRANSISTOR PULSER DESIGNED TO DRIVE  
GA AS RADAR-LASER DIODE A67-12964
- PULSED LASER Q-FACTOR MODULATION USING NONLINEAR  
RESONATOR FUNCTIONS IN ABSORBING MEDIUM  
A67-13135
- FLUORESCENT EMISSION OF NEODYMIUM LASER TRIGGERED  
BY POKELS EFFECT AS FUNCTION OF POPULATION  
INVERSION A67-13201
- MODE CHARACTERISTICS OF SOLID STATE LASERS FROM  
ANALYTICAL SOLUTION OF CONSERVATIVE EQUATION  
A67-13208
- PERFORMANCE OF TWO-PHOTON LASER OPERATING IN  
CONTINUOUS WAVE MODE, DERIVING FORMULA FOR PULSE  
FREQUENCY A67-13292
- TRANSITION TO DETONATION IN GASEOUS MEDIUM  
EXPERIMENTALLY STUDIED, BASED ON SELF-SUSTAINED  
DETONATION FRONT AND ADAPTATION OF AMPLITUDE  
MODULATED GIANT PULSE LASER SYSTEM  
A67-13500
- EXPANSION VELOCITY OF LUMINOUS FRONT OF PLASMA  
PLUME GENERATED BY GIANT PULSE LASER  
A67-13573
- COUPLING OF PULSE POWERS IN TEM OF UP TO 80 MW  
FROM HE- NE LASER AT 6328 ANGSTROMS  
A67-13678
- HIGH TEMPERATURE SINGLE SOLID PARTICLE PLASMA  
GENERATION BY FOCUSED GIANT PULSE Q-SPOILED RUBY  
LASER BEAM IRRADIATION OF LI H SUSPENDED IN  
VACUUM ELECTRIC FIELDS A67-14047
- PERFORMANCE CHARACTERISTICS FOR PULSE TYPE AR  
LASER WITH EXTERNAL INTERFERENTIAL SYSTEM OF  
QUASI-CONFOCAL SPHERICAL MIRRORS  
A67-14188
- CHARACTERISTICS OF PULSED LASER ACTION IN HE- NE  
AND HE- AR MIXTURES AT PRESSURES ABOVE 200 MM HG  
A67-14189
- TEMPORAL-SPATIAL VARIATION OF CROSS SECTIONAL FLUX  
DISTRIBUTION OF STIMULATED EMISSION FROM ND GLASS  
PULSED LASER A67-14280
- DISINTEGRATION OF ALKALI HALIDE SINGLE CRYSTALS,  
POLYMERS AND GLASSES UNDER LASER RADIATION, NOTING  
PARAMETERS OF DISINTEGRATION REGION MAGNITUDE

A67-14367  
PULSED LASERS AS MACHINE TOOLS FOR MATERIAL REMOVAL, NOTING TESTS ON TITANIUM, ALUMINUM OXIDE, STEEL, ETC A67-15308

LASER PULSE ENERGY MEASUREMENTS WITH LIQUID ABSORPTION CELL CALORIMETER A67-15456

VAPORIZATION OF THIN METALLIC FILMS WITH FOCUSED LASER BEAM, COMPARING THEORETICAL AND EXPERIMENTAL RESULTS PREPARED BY USING PULSED HIGH PRESSURE HELIUM-NEON LASER A67-15478

SHORT PULSE Q-SWITCHED LASER WITH VARIABLE PULSE LENGTH A67-16641

RUBY LASER WITH NONRESONANT FEEDBACK DUE TO RADIATION SCATTERING, SHOWING USE AS OPTICAL FREQUENCY STANDARD A67-16642

PULSED GAS DISCHARGE LASERS NOTING REQUIRED ENERGY LEVEL FOR MAXIMUM EFFICIENCY, EXPERIMENTAL TECHNIQUES AND RESULTS A67-16650

DIVALENCE SAMARIUM ION DOPED CALCIUM FLUORIDE LASER ACTION AT LOW TEMPERATURES OBTAINED WITH GIANT PULSE RUBY LASER EXCITATION A67-16661

EQUATION FOR DYNAMICAL BEHAVIOR OF LASER, SOLVING CASE OF DEEP MODULATION OF OUTPUT, NOTING PULSATION PROBLEMS A67-16662

DYSPROSIUM DOPED CALCIUM FLUORIDE GIANT PULSE LASER WITH HIGH REPETITION RATE OBTAINED, USING DC PUMPING XENON LAMP A67-16674

SATURATED ABSORPTION OF COLOR CENTERS IN GLASS SELF- Q-SWITCHED PULSES, AS IN GLASS CODOPED WITH URANYL OXIDE AND ND IONS A67-16678

QUENCHING OF ONE PULSED RUBY LASER OSCILLATION BY ANOTHER, NOTING COUPLED RATE EQUATIONS FOR STEADY STATE AND TRANSIENT BEHAVIOR A67-16682

TUNABLE RAMAN LASER OBTAINED BY ELECTRON MOBILITY SUBJECTED TO MAGNETIC FIELD, NOTING THRESHOLD PUMP POWER A67-16684

ENHANCED LASING OF HIGH PRESSURE HE- NE LASER, COMMENTING ON DELAY TIME OF LIGHT PULSE EMITTING THROUGH WALLS OF DISCHARGE TUBE FROM START OF EXCITING PULSE A67-16687

STIMULATED EMISSION IN TRIPLET SYSTEM OF NITROGEN MOLECULE PRODUCED BY PULSED LASER DISCHARGE, IDENTIFYING LINES AND INTERPRETING INTENSITY DISTRIBUTION IN ROTATIONAL BAND SPECTRUM A67-16785

TEMPERATURE FIELD OF ACTIVE MEDIUM OF PULSED LASER USING VARIATIONAL METHODS, CONSIDERING TWO APPROXIMATE SOLUTIONS A67-16935

TRANSIENT BEHAVIOR OF HE- NE LASERS UNDER PULSED HF EXCITATION, DISCUSSING RATE EQUATIONS REPRESENTING ATOMIC POPULATION DENSITY AND PHOTON DENSITY A67-16980

NONLINEAR PROPAGATION OF PULSE SIGNAL IN LASER TYPE TRAVELING WAVE AMPLIFIER A67-17232

PERIODIC AUTOMODULATION OF RADIATION AND POSSIBILITY OF GENERATING GIANT PULSES IN THREE-LEVEL LASER WITH INHOMOGENEOUSLY EXCITED ACTIVE MEDIUM A67-17233

EXTENSION OF PAPER ON SATURABLE ABSORBER GIANT PULSE LASERS TO INCLUDE EFFECTS OF FINITE ABSORBER LIFETIME ON PULSE PARAMETERS, NOTING PUMP ROLE A67-18148

PLASMA FORMED BY LASER PULSE ON TUNGSTEN TARGET, MEASURING RADIUS, TEMPERATURE AND RADIATIVE PROPERTIES, DEVELOPING MODEL A67-18149

TREATMENT OF STEEL WITH LASER BEAM, OBTAINING PRECISION HOLES WITHOUT AFFECTING MICROHARDNESS OF

METAL A67-18234

SEMICONDUCTOR MIRROR FOR Q-FACTOR MODULATION OF LASER RESONATOR A67-18789

CLEAVAGE AND SEPARATION OF DYE-DOPED ICE AND PARAFFIN INSTANTANEOUSLY HEATED BY LASER PULSE, MEASURING MECHANICAL PULSE AT ENERGY CONCENTRATIONS BELOW VAPORIZATION HEAT A67-18807

NANOSECOND PULSE LIGHT SOURCES USED IN FREE FLIGHT HYPERSONICS FOR BALLISTIC RANGE MEASUREMENTS, NOTING LESS PHOTOGRAPHIC BLURRING OF MOTION A67-18881

LASER APPLICATION TO METEOROLOGY, DISCUSSING RAYLEIGH, AEROSOL AND RAMAN SCATTERING, SYSTEM CONFIGURATION AND MEASUREMENT PROBLEMS A67-19091

CHANGES IN GIANT MOLECULE STRUCTURE OF POLYPROPYLENE FILMS UNDER ACTION OF LASER PULSES ANALYZED BY OPTICAL MICROSCOPY A67-19169

TRAVELING WAVE EXCITATION OF HIGH POWER NITROGEN AND NEON LASERS WITH VELOCITY MATCHING THAT OF STIMULATED EMISSION A67-20093

TIME BEHAVIOR OF PULSED WATER VAPOR LASER, NOTING SPIKING FROM FAR IR EMISSION LINES A67-20095

TIME RESOLVED SPECTROSCOPY OF FLASHLAMP PULSES A67-20952

QUANTUM ELECTRONICS, PULSED LASERS, PHOTOEFFECTS, LASER EMISSION, AND FIELD THEORY - CONFERENCE REPORT A67-17910

HOLOGRAM MEASUREMENTS OF OPTICALLY INHOMOGENEOUS FIELD BY PULSED LASER A67-19271

**PULSED RADIATION**

OPTICAL EMISSION FROM RUBY INDUCED BY SHORT PULSES OF RELATIVISTIC ELECTRONS IN WHICH ELECTRON-HOLE RECOMBINATION PRODUCES EXCITATION OF EMISSION A66-26173

PULSED TOROIDAL EXCITATION OF GAS ION LASERS EXTENDED TO DRIVE HIGH POWER CW LASER TRANSITIONS IN AR, KR, CL AND BR, NOTING OPERATING PARAMETERS AND POWER OUTPUT A66-28877

C W IR LASER OSCILLATION IN ATOMIC CL IN H CL AND HI GAS DISCHARGES, NOTING USE OF TWO POWER SUPPLIES AND ENERGY LEVEL DIAGRAM A66-28880

CHARACTERISTICS OF EFFICIENT SEMICONDUCTOR LASERS IN UV PORTION OF SPECTRUM OBTAINED AT BOTH LIQUID HELIUM AND NITROGEN TEMPERATURES, USING PULSED ELECTRON BEAM EXCITATION ON ZN S CRYSTALS A66-39114

OPTICAL FREQUENCY TRANSLATION OF PULSES FROM MODE LOCKED LASER, NOTING DOPPLER SHIFTS OF LARGE MAGNITUDE A67-12506

NITRIC OXIDE MOLECULAR LASER OBTAINED BY DISSOCIATION OF N O- CL IN PULSED ELECTRICAL DISCHARGE A67-12510

GIANT OPTICAL RADIATION PULSES FROM RUBY LASERS BY CONTROL OF STATIC CAVITY GEOMETRY A67-10950

**PUMPING**

DIRECT CURRENT PUMPING AND COMBINED MICROWAVE ELECTRON-CYCLOTRON RESONANCE WITH DIRECT CURRENT PUMPING EFFECTS ON DISCHARGE BEHAVIOR AND ARGON LASER OPERATION A66-29240

SATURABLE OPTICAL FILTER IN LASER AMPLIFICATION CHAIN USED AS ISOLATOR TO LIMIT RADIANCE DEPUMPING EFFECTS

AD-632007 N66-30020  
 MAXIMUM OUTPUT POWER FROM RUBY LASER AS FUNCTION  
 OF PUMPING FOR SEVERAL INTERFEROMETER BASE  
 VALUES  
 TG-230-T479 N66-37072

## Q

## Q-FACTOR

FAST-ACTING FLUID SEAL FOR Q-FACTOR MODULATION OF  
 NEODYMIUM GLASS LASER A66-27595

RELATIONSHIP BETWEEN AMPLIFICATION, BANDWIDTH AND  
 NOISE TEMPERATURE IN MASER AMPLIFIER, CONSIDERING  
 PARAMAGNETIC PERMEABILITY AND Q-FACTOR A66-29051

Q-FACTOR MODULATION OF RUBY-LASER RESONATOR BY  
 PHTHALOCYANINE SERIES A66-29353

LASER Q-FACTOR MODULATION BY SPECTRAL ABSORPTION  
 FILTERS WITH INVERSE BLEACHING A66-29354

LARGE WAVELENGTH CHANGES IN GALLIUM ARSENIDE  
 INJECTION LASERS DUE TO CHANGES IN CAVITY Q A66-32635

LASER REGIME WITH GIANT PULSES GENERATED IN  
 DYSPROSIUM DOPED CADMIUM FLUORIDE UNDER CONTINUOUS  
 PUMPING BY XENON LAMPS, OBTAINING Q FACTOR  
 MODULATION BY ROTATING PRISM A66-34178

Q-FACTOR MODULATION OF RUBY-LASER RESONATOR BY  
 PHTHALOCYANINE SERIES A66-37358

SPECTRAL CHARACTERISTICS OF TWO-PHOTON OPTICAL  
 EXCITATION AND LIGHT EMISSION FROM CD SE  
 SEMICONDUCTOR LASER WITH MODULATED Q-FACTOR A66-37565

LASER MODE-LOCKING DURING RESONATOR Q-FACTOR  
 MODULATION A66-39303

STABLE LIMITING CYCLES OF LASER RESULTING FROM  
 MUTUAL SYNCHRONIZATION OF PHASE-SHIFTED  
 OSCILLATION MODES A66-39653

FREQUENCY DOUBLING OF LASER LIGHT WITH VARIABLE  
 Q-SWITCHED RESONATOR A66-39654

GIANT PULSE GENERATION RANGE IN TRANSVERSE  
 DIRECTION AFTER Q-SWITCHING IN RUBY LASER,  
 EXAMINING RESONATOR PROPERTIES A66-42516

FAST-ACTING FLUID SEAL FOR Q-FACTOR MODULATION OF  
 NEODYMIUM GLASS LASER A66-42729

RUBY LASER WITH LIQUID FILTER, CONSIDERING  
 RELATION BETWEEN FILTER EFFICIENCY AND ABSORPTION  
 CURVE PARAMETERS WHEN ACTING AS Q-FACTOR  
 MODULATOR A67-12423

PULSED LASER Q-FACTOR MODULATION USING NONLINEAR  
 RESONATOR FUNCTIONS IN ABSORBING MEDIUM A67-13135

SPECTRAL CHARACTERISTICS OF TWO-PHOTON OPTICAL  
 EXCITATION AND LIGHT EMISSION FROM CD SE  
 SEMICONDUCTOR LASER WITH MODULATED Q-FACTOR A67-15299

SEMICONDUCTOR MIRROR FOR Q-FACTOR MODULATION OF  
 LASER RESONATOR A67-18789

## Q-SPOILING

SEGMENTED-ROD RUBY LASER STRUCTURE OPERATED AS  
 GIANT PULSE LASER, USING KERR CELL TO PROVIDE  
 Q-SWITCHING, NOTING NUMBER OF OSCILLATING MODES A66-25038

RUBY LASER AMPLIFIER DYNAMICS, NOTING AMPLIFICATION  
 IN ENERGY GAIN REGIMES AND CORRELATION TO  
 THEORETICAL EQUATIONS A66-25049

FORMATION OF ULTRASONICALLY GATED GIANT LASER  
 PULSES BY Q-SPOILING, NOTING PHOTOGRAPHS OF RUBY  
 AND ROLE OF CAVITATION IN GATING MECHANISM A66-25057

HOLE BURNING IN BLEACHABLE ABSORBERS USED AS LASER  
 Q-SPOILER A66-29387

REVERSIBLE BLEACHABLE DYE-SOLUTIONS FOR EXPANDER  
 ELEMENTS IN LASER A66-29388

Q MODULATION OF LASER THEORY AND APPLICATION,  
 PRESENTING GIANT PULSE PRODUCTION,  
 PHENOMENOLOGICAL THEORY, OUTPUT RESPONSE TO STEP  
 FUNCTION CHANGE, ELECTRO-OPTIC AND MECHANICAL  
 MODULATORS A66-36971

ELECTRON BEAM SCANLASER BASED ON LASER CAVITY  
 DIRECTLY AND/OR TRANSVERSELY DEGENERATE HAVING Q-  
 SPOILED FOR ALL MODES BUT ONE A66-38244

DYNAMIC LASER WAVELENGTH SELECTION BY INSERTION OF  
 DISPERSIVE TUNABLE ELECTRO-OPTIC Q-SPOILER WITHIN  
 LASER CAVITY A66-40866

MERCURY, CESIUM AND RUBIDIUM VAPORS IONIZATION IN  
 INTENSE RADIATION FLUX BY Q-SWITCHED RUBY LASER A66-41156

QUANTUM THEORY OF Q-SPOILED LASER, NOTING  
 STATISTICS OF NUMBER OF PHOTONS IN MODE BEAR  
 QUALITATIVE RESEMBLANCE TO POISSON STATISTICS A66-41373

STIMULATED EMISSION OF POLYMETHINE DYES UPON  
 PUMPING WITH Q-SWITCHED LASER, NOTING WAVELENGTH  
 PARAMETERS AND OSCILLATION A66-42247

Q-SWITCHING LASER SYSTEM TO OBTAIN SIMULTANEOUS  
 GIANT PULSES FROM FIVE RUBY LASER OSCILLATORS A66-42302

Q-SWITCHING OF RUBY LASER USING CELL CONTAINING  
 CHLOROALUMINUM PHTHALOCYANINE IN CHLORONAPHTHALENE  
 TO OBTAIN GIANT PULSES A67-10448

SINGLE SELF-MODE-LOCKED PULSE SELECTION FROM  
 BLEACHABLE DYE Q-SWITCHED ND-DOPED GLASS LASER A67-10875

NARROW BEAM DIVERGENT Q-SWITCHED LASER PULSE  
 GENERATION, NOTING OUTPUT CHARACTERISTICS AND  
 APPLICATIONS A67-11024

Q-SPOILING OF RUBY LASER BY OPTICAL PUMPING IN  
 INTENSE INHOMOGENEOUS MAGNETIC FIELD WITH  
 REDUCED GAIN A67-12505

FLUORESCENT EMISSION OF NEODYMIUM LASER TRIGGERED  
 BY POKKELS EFFECT AS FUNCTION OF POPULATION  
 INVERSION A67-13201

SHORT PULSE Q-SWITCHED LASER WITH VARIABLE PULSE  
 LENGTH A67-16641

POSITIVE ION EMISSION FROM TUNGSTEN SURFACES LASER  
 IRRADIATED STUDIED, USING TIME-OF-FLIGHT  
 SPECTROMETER A67-16651

GAS DYNAMIC EQUATIONS FOR DETERMINATION OF  
 HEATING, VAPORIZATION AND EXPANSION OF SUBSTANCE  
 DUE TO Q-SWITCHED LASER RADIATED COLLIMATES ONTO  
 SURFACE OF SOLIDS A67-16652

TERMINAL LEVEL LIFETIME AND FLUORESCENCE LINE OF  
 NEODYMIUM DOPED GLASS INFLUENCE ON DYNAMICS AND  
 EFFICIENCY OF Q-SPOILED LASER A67-16675

Q-SWITCHED RUBY LASER CONFIGURATION WITH FEEDBACK  
 CONTROL, NOTING FREQUENCY AND INSTABILITY  
 CORRELATION WITH THEORETICAL RESULTS OBTAINED  
 FROM MATHEMATICAL MODEL A67-16676

SATURATED ABSORPTION OF COLOR CENTERS IN GLASS  
 SELF- Q-SWITCHED PULSES, AS IN GLASS CODOPED WITH  
 URANYL OXIDE AND ND IONS A67-16678

Q-SWITCHED LASER OPERATION OBSERVED USING LIQUID  
 SELENIUM MIRROR AS REFLECTOR IN RUBY LASER  
 MEASURING REFLECTIVITY CHANGES A67-16679

OPERATION OF SYNCHRONIZED NEODYMIUM LASER TIME  
 VARIABLE REFLECTION / TVR/ OSCILLATOR, USING  
 SINGLE POKKELS CELL TO OBTAIN Q-SWITCHING AND

- CAVITY DUMPING A67-17525
- QUANTUM AMPLIFIER  
Q-SWITCHED LASERS, INTERACTION OF HIGH POWER LIGHT PULSE WITH MATTER AND SEMICONDUCTOR LASERS PUMPED WITH OPTICAL RADIATION AND ELECTRON BEAMS INVESTIGATED, USING QUANTUM OSCILLATOR AND AMPLIFIER A66-26180
- QUANTUM ELECTRODYNAMICS  
LASER AND MASER DEVELOPMENT, DISCUSSING DESIGN IMPROVEMENTS AND APPLICATION FOR TELEVISION, SPACE COMMUNICATIONS, ETC A66-32353
- GENERAL NONEQUILIBRIUM SYSTEM IN CONTACT WITH RESERVOIR DESCRIBED VIA CORRELATION FUNCTIONS OF QUANTIZED FIELD OPERATORS, NOTING INFLUENCE OF CAVITY AND OPTICAL PUMP A66-38633
- FREQUENCY TEMPERATURE DEPENDENCE OF LONGITUDINAL AND TRANSVERSE HYPERSONIC WAVE ABSORPTION COEFFICIENTS IN QUARTZ AND ARTIFICIAL RUBY CRYSTAL A66-42514
- SOVIET PAPERS ON QUANTUM ELECTRONICS A67-13124
- PHOTODETACHMENT PROBABILITY FOR CS AND NEGATIVE I DUE TO SIMULTANEOUS ABSORPTION OF TWO RUBY QUANTA A67-16627
- BIBLIOGRAPHY ON LASERS COVERING MODES, SCATTERING MECHANISMS, QUANTUM ELECTRODYNAMICS, MATTER-RADIATION INTERACTION, PLASMA, HOLOGRAPHY AND OPTICS A67-17890
- R CA PAPERS ON LASER RESEARCH AND ENGINEERING A67-19079
- CHARGED PARTICLES FOR LASING, DISCUSSING MANUFACTURE OF ARGON LASER A67-19083
- QUANTUM ELECTRONICS, PULSED LASERS, PHOTOEFFECTS, LASER EMISSION, AND FIELD THEORY - CONFERENCE REPORT FTD-HT-66-458 N67-17910
- QUANTUM GENERATOR  
SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION A66-27187
- SEMICLASSICAL THEORY OF QUANTUM GENERATORS, EXAMINING LASER SYSTEM RESPONSE TO EFFECT OF MONOCHROMATIC STANDING WAVE BASED ON KINETIC EQUATION FOR DENSITY MATRIX A66-30865
- MODE CHARACTERISTICS OF SOLID STATE LASERS FROM ANALYTICAL SOLUTION OF CONSERVATIVE EQUATION A66-33839
- HIGH FREQUENCY-STABILITY EM WAVE SOURCE, APPLYING THERMAL EXCITATION METHODS TO PENCIL QUANTUM GENERATOR IN IR REGION A66-39336
- HIGH FREQUENCY-STABILITY EM WAVE SOURCE, APPLYING THERMAL EXCITATION METHODS TO PENCIL QUANTUM GENERATOR IN IR REGION A66-39706
- GA AS SEMICONDUCTOR QUANTUM GENERATOR HEATING DURING INJECTION PULSE, ANALYZING TEMPERATURE EFFECT ON EXTERNAL QUANTUM OUTPUT AND GENERATOR EFFICIENCY A66-41621
- SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION A66-43085
- QUANTUM GENERATORS AND COHERENT LIGHT AMPLIFIERS JPRS-36295 N66-29984
- SPLITTING OF METASTABLE LEVEL OF THREE-LEVEL RUBY LASER TG-230-T467 N66-34267
- DESIGNS OF QUANTUM ELECTRONIC SYSTEMS - RUBY LASERS, QUANTUM AND OPTICAL GENERATORS, OPTICAL GATES, WAVEGUIDES, ELECTROMAGNETIC WAVE PROPAGATION, AND COMMUNICATION SYSTEMS
- JPRS-37132 N66-37709
- OPTIMUM OPERATING CONDITIONS OF RUBY LASER QUANTUM GENERATOR WITH PASSIVE SHUTTER N66-37711
- MODE CHARACTERISTICS OF SOLID STATE LASERS FROM ANALYTICAL SOLUTION OF CONSERVATIVE EQUATION A67-13208
- I- V CHARACTERISTIC OF GA AS DIODE WITH FABRY-PEROT RESONATOR, NOTING VARIATIONS DURING AMPLIFICATION TO GENERATION TRANSITION A67-15132
- QUANTUM MECHANICS  
NONLINEAR SUSCEPTIBILITY DESCRIBING SECOND HARMONIC GENERATION OF LIGHT MEASURED IN SEMICONDUCTORS WITH ZINC-BLENDE SYMMETRY, USING QUANTUM MECHANICS AND LASER WAVELENGTH A66-26149
- MULTIPLE QUANTUM EQUATIONS FOR MODE AMPLITUDE AND FREQUENCY DETERMINATION FOR MAGNETIC FIELD-TUNED GAS OPTICAL MASER A66-26200
- NONLINEAR QUANTUM MECHANICAL ANALYSIS OF LASER STEADY MOTION, STABILITY UNDER DEVIATIONS AND NOISE EFFECT ON LINE WIDTH AND INTENSITY FLUCTUATIONS A66-26213
- RADIATIVE CORRECTIONS TO THOMSON SCATTERING IN LASER BEAMS ARISING FROM DAMPING OF ELECTRON MOTION AND PHOTON DENSITY, USING QUANTUM MECHANICS A66-30628
- LASER CAVITY OUTPUT OPTIMIZATION FOR MAXIMUM EXTERNAL QUANTUM EFFICIENCY SHOWING DEPENDENCE ON LENGTH AND REFLECTIVITY FOR GIVEN CURRENT DENSITY A66-31535
- PULSED RUBY LASERS, CONSIDERING PUMPING AND THRESHOLD, OUTPUT, QUANTUM MECHANICS AND VARIATION ON BASIC DEVICE A66-36968
- FOKKER- PLANCK EQUATION APPLIED TO LASER UNDER INFLUENCE OF QUANTUM FLUCTUATIONS CONNECTED WITH DISSIPATION, PUMPING AND CAVITY THERMAL NOISE, NOTING DISTRIBUTION AND CORRELATION FUNCTION A66-38930
- PHOTOELECTRON EMISSION STATISTICS DETERMINING PROBABILITY DISTRIBUTION OF PHOTOELECTRON COUNTS IN PHOTOMULTIPLIER ILLUMINATED BY LASER BELOW AND ABOVE THRESHOLD OF OSCILLATION A66-42543
- PHASE AND AMPLITUDE FLUCTUATION OF GAS AND SOLID STATE LASERS, ACCOUNTING FOR NOISE CAUSED BY PUMPING, INCOHERENT DECAY, LATTICE VIBRATIONS AND ATOMIC COLLISIONS A67-14949
- POLARIZATION OF LIGHT SCATTERED FROM HE- NE LASER BEAM, APPLYING QUANTUM THEORY TO FORMULA FOR DEPOLARIZATION RATIO A67-15624
- SEMICONDUCTOR LASERS NOTING STRONG FIELD BEHAVIOR AND ABSORPTION COEFFICIENT FOR SATURATION A67-16672
- ELECTROLUMINESCENCE, DISCUSSING SEMICONDUCTOR LASERS WITH VARIOUS EXCITATION SOURCES, LUMINESCENT EFFICIENCY, ETC A67-17889
- QUANTUM THEORY  
QUANTUM THEORY FOR NOISE IN STEADY STATE OF LASER OSCILLATOR ABOVE THRESHOLD, COMPARING SEMICLASSICAL AND QUANTIZED LINEAR THEORIES A66-25650
- QUANTUM THEORY OF LASERS PRESENTED IN TERMS OF CORRELATION FUNCTIONS OF SECOND-QUANTIZED ELECTROMAGNETIC AND MATTER FIELDS A66-26214
- QUANTUM THEORY OF LASER HAVING ONLY SINGLE-MODE OSCILLATION AND IGNORING ATOMIC MOTION AND SPATIAL VARIATIONS IN CAVITY MODE A66-29117
- SECOND HARMONIC GENERATION BY LASER BEAMS OF FINITE SPECTRAL WIDTH, USING QUANTUM TRANSITIONS

- AND KINETIC EQUATIONS, NOTING SHAPE OF PUMPING  
LINE AT FUNDAMENTAL FREQUENCY A66-30845
- QUANTUM THEORY OF LASER MODEL, DERIVING KINETIC  
EQUATIONS FOR RADIATION AND SINGLE-PARTICLE  
DENSITY MATRICES, USING BOGOLIUBOV EXPANSION  
PROCEDURE A66-36008
- QUANTUM THEORY OF Q-SPOILED LASER, NOTING  
STATISTICS OF NUMBER OF PHOTONS IN MODE BEAR  
QUALITATIVE RESEMBLANCE TO POISSON STATISTICS  
A66-41373
- MASTER EQUATION SOLVED TO OBTAIN DIAGONAL ELEMENTS  
OF DENSITY MATRIX FOR LASER LIGHT, TAKING INTO  
ACCOUNT PUMPING SCHEME CHARACTERIZING THREE-LEVEL  
LASER A66-41374
- SOVIET PAPERS ON QUANTUM ELECTRONICS  
A67-13124
- HYPERSONIC EXCITATIONS DUE TO BRILLOUIN  
SCATTERING FOR CASE WITH STOKES FEEDBACK,  
DERIVING QUANTUM EQUATION OF MOTION FOR CREATION  
OF LASER AND STOKES MODES AND COUPLED ACOUSTIC  
MODE A67-16683
- QUARTZ**  
STIMULATED BRILLOUIN SCATTERING IN QUARTZ  
ANALYZED, NOTING AMPLIFICATION, STOKES WAVE  
GENERATION AND RUBY GAIN A66-26165
- INTERNAL PHASE MODULATION IN HE- NE LASER USING  
ELECTRO-OPTIC EFFECT IN CRYSTAL QUARTZ, OBSERVING  
SPECTRUM AND RF MODE BEATS A66-32621
- FREQUENCY STABILITY OF DOUBLE BEAM AMMONIA LASER  
WITH THERMOSTATIC QUARTZ RESONATORS ON 3-2 LINE  
A67-10247
- TWO-LEVEL RESONATOR TYPE LASER USING NEUTRON-  
IRRADIATED QUARTZ SINGLE CRYSTAL WITH HIGH  
RECURRENT INVERSION FREQUENCY A67-15158
- QUARTZ LIGHT**  
METAL WALL IONIZED ARGON LASERS, DISCUSSING USE OF  
WATER-COOLED QUARTZ DISCHARGE CHANNELS, CW  
LASERS, DEVELOPMENT OF SATISFACTORY METAL, ETC  
A66-25555
- QUENCHING**  
THRESHOLD STUDIES OF ION LASER OSCILLATIONS IN  
SULFUR AND SATURATION AND QUENCHING OF LASER  
INTENSITY A66-26209
- RELATION BETWEEN NONLINEAR LUMINESCENCE  
QUENCHING AND CONCENTRATION OF LUMINESCENCE  
CENTERS IN LASER CRYSTAL A66-29204
- SELECTIVE DIFFUSED JUNCTION LASER, DISCUSSING  
GA AS LASER USED FOR QUENCHING EXPERIMENT  
A66-32408
- RELATION BETWEEN NONLINEAR LUMINESCENCE QUENCHING  
AND CONCENTRATION OF LUMINESCENCE CENTERS IN  
LASER CRYSTAL A66-33053
- QUENCHING AND HYSTERESIS EFFECTS BETWEEN ZEEMAN  
OSCILLATIONS ON SINGLE AXIAL MODE OBSERVED IN  
NEAR-ZERO MAGNETIC FIELDS FOR SHORT PLANAR LASER  
A66-39116
- R**
- RABBIT**  
EFFECTS OF RUBY LASER RADIATION ON OCULAR TISSUE  
OF RABBITS AND ESTIMATION OF HUMAN CORNEAL  
THRESHOLD  
FA-R-1815 N67-10968
- RADAR**  
TUNABLE TRAVELING WAVE MASER FOR DEEP SPACE  
COMMUNICATIONS AND PLANETARY RADAR  
JPL-TR-32-1072 N67-17168
- RADAR ALTIMETER**  
OPTO-ELECTRONIC AIRCRAFT ALTIMETER CONCEPT BASED  
ON PROPERTIES OF ELECTRON INJECTION LASERS AND  
SILICON PHOTODIODES N67-13079
- RADAR EQUIPMENT**  
THERMALLY TUNED RUBY LASER RADAR FOR DETERMINING  
VERTICAL PROFILE OF ATMOSPHERIC WATER VAPOR  
TR-66-9 N66-35539
- RADAR MEASUREMENT**  
MEASUREMENT OF DISTANCE TO MOON BY OPTICAL  
RADAR, DISCUSSING RUBY LASER/PHOTOMULTIPLIER  
APPARATUS AND PROCEDURE A66-30291
- RADAR OBSERVATION**  
ATMOSPHERIC OBSERVATION WITH ADVANCED LIGHT RADAR,  
NOTING EQUIPMENT CHARACTERISTICS, MOLECULAR  
SCATTERING MECHANISM, ETC A66-26133
- RADAR SCATTERING**  
ATMOSPHERIC EXPLORATION WITH LIDAR, NOTING HIGH  
RESOLUTION AND SENSITIVITY A66-28600
- RADAR SYSTEM**  
HIGH POWERED Q-SWITCHED RUBY LASER / LIDAR/ FOR  
METEOROLOGICAL APPLICATION, NOTING SYSTEM  
EQUATIONS, DESIGN, OPERATION, ETC A66-26548
- PHOTOGRAPHIC RADAR SYSTEM EMPLOYING Q-SWITCHED  
RUBY LASER, MULLARD TYPE 6929 IMAGE TUBE AND  
CONVENTIONAL CAMERA A66-38796
- SATELLITE TRACKING WITH LASER - RANGE EQUATION,  
DETECTION AT NIGHT AND IN DAYLIGHT,  
NONCOOPERATIVE SATELLITES, AND COMPARISON OF  
OF LASER AND RADAR SYSTEMS  
NASA-CR-76902 N66-32684
- RADIANT HEATING**  
GAS DYNAMIC EQUATIONS FOR DETERMINATION OF  
HEATING, VAPORIZATION AND EXPANSION OF SUBSTANCE  
DUE TO Q-SWITCHED LASER RADIATED COLLIMATES ONTO  
SURFACE OF SOLIDS A67-16652
- RADIATION**  
CEREBRAL CORTEX OF DOG AS AFFECTED BY LASER  
RADIATION A66-82035
- GEOMETRICAL OPTICS APPROXIMATION SOLUTION TO  
RADIATION POWER OF GAS LASER AS FUNCTION OF  
MIRROR MISALIGNMENT ANGLE  
TG-230-T474 N66-34884
- LASER RADIATION EFFECT ON EYE - RETINAL BURNS,  
IMAGERY, AND SAFETY PRESCRIPTION  
TDCX-46027 N66-39840
- FRACTURE MECHANISM OF TRANSPARENT CRYSTALS  
INTERACTING WITH RUBY LASER BEAM  
A67-13128
- RADIATION ABSORPTION**  
LASER MODE OPERATION IN PRESSURE OF RADIATION  
ABSORBING IMPURITY ANALYZED BY EXTENDED THOMSON  
TYPE SYSTEM A66-31558
- BIOLOGICAL EFFECTS AND DOSIMETRY OF ABSORBED  
RADIATION FROM RUBY LASER N66-37710
- LOSSES IN RUBY LASER DETERMINED FROM DATA ON  
VARIATIONS IN BEAM DIVERGENCE ANGLE AND VARIATIONS  
IN LASING SPOT DIAMETER A67-12742
- RADIATION CONTROL**  
RADIATION CONTROL OF RUBY LASER BY DIFFRACTION  
MODULATOR WITH TRAVELING ULTRASONIC WAVE, NOTING  
COMPUTER SOLUTION OF KINETIC EQUATIONS OF  
POPULATION BALANCE, RADIATION DENSITY,  
CHARACTERISTIC DAMPING, ETC A66-33515
- RADIATION CONTROL OF RUBY LASER BY DIFFRACTION  
MODULATOR WITH TRAVELING ULTRASONIC WAVE, NOTING  
COMPUTER SOLUTION OF KINETIC EQUATIONS OF  
POPULATION BALANCE, RADIATION DENSITY,  
CHARACTERISTIC DAMPING, ETC A66-42128
- RADIATION COOLING**  
ELECTRON RECOMBINATION IN LASER PRODUCED HYDROGEN  
DISCHARGE, NOTING TEMPERATURE DECAY DUE TO  
RADIATION, EXPANSION COOLING AND ELECTRON LOSS  
A67-15109

## RADIATION DETECTOR

FAR- IR LASER MOLECULAR SPECTROSCOPY INCLUDING IR LASER OSCILLATORS, PHOTON NOISE, DETECTORS AND NUCLEAR OPTICS A66-26195

LASER DETECTION OF COHERENT LIGHT AND SUPERHETERODYNE AND NONLINEAR PARAMETRIC STUDIES IN OPTICAL SPECTRUM A66-27821

FAR IR RADIATION DETECTED AT VISIBLE FREQUENCY, USING NONLINEAR OPTICAL MIXING WITH LASERS A66-33322

OPTICAL HETERODYNE RECEIVER ANTENNA PROPERTIES, NOTING EFFECTIVE APERTURE OF CAPTURE CROSS SECTION VS DIRECTIONAL TOLERANCE AND DETECTION OF DOPPLER SHIFTS IN LIQUID SCATTERED COHERENT LIGHT A66-42809

## RADIATION DISTRIBUTION

INTERCHANNEL GENERATION TRANSFER AND MULTICHANNEL GENERATION IN LASER WITH FOUR UNSPLIT LEVELS, NOTING RADIATION DENSITY, TEMPERATURE EFFECT AND VARIATIONS IN COEFFICIENTS OF LOSSES A66-38956

ATMOSPHERIC TURBULENCE EFFECT ON LASER BEAM INTENSITY DISTRIBUTION A66-41030

TEMPORAL-SPATIAL VARIATION OF CROSS SECTIONAL FLUX DISTRIBUTION OF STIMULATED EMISSION FROM ND GLASS PULSED LASER A67-14280

INTERCHANNEL GENERATION TRANSFER AND MULTICHANNEL GENERATION IN LASER WITH FOUR UNSPLIT LEVELS, NOTING RADIATION DENSITY, TEMPERATURE EFFECT AND VARIATIONS IN COEFFICIENTS OF LOSSES A67-15760

## RADIATION EFFECT

PROTECTION AND HAZARD TO EYES OF UNINFORMED OPERATORS AND BYSTANDERS FROM LASER LIGHT A66-27668

CHORIORETINAL LESION PRODUCED BY PULSED RUBY LASER BEAM AND COMPLEX CHANGES IN RETINAL EXCITABILITY IN CATS A66-31761

PHOTOCONDUCTIVITY INDUCED IN UNCOLORED SODIUM CHLORIDE AND ALUMINUM OXIDE SINGLE CRYSTALS BY RADIATION FROM RUBY LASER A66-33939

LASER RADIATION EFFECT ON METALS, NOTING DISINTEGRATION MECHANISM, INDENTATION FORMATION AND VAPOR FORMATION A66-39763

RADIATION NOISE EFFECT ON LASER OPTICAL PROPERTIES, NOTING DENSITY VS RESONATOR CHARACTERISTICS, ENERGY SPECTRUM, ETC A66-40917

EFFECTS OF SPACE RADIATION ON LASERS NASA-CR-79108 N66-39911

POLYMETHYLMETHACRYLATE AND POLYSTYRENE EXPOSURE TO RUBY AND NEODYMIUM-GLASS LASER RADIATION, NOTING APPEARANCE OF EPR A67-10075

MOLECULAR SPECTROSCOPY OF ILLUMINATION EFFECTS ON COBALT ACTIVATED ZN S EXPOSED TO RUBY LASER PULSES A67-10683

VISUAL ACUITY DECREMENT FROM LASER LESION IN FOVEA OF STUMP TAIL MACAQUE MONKEYS A67-16287

DAMAGE IN GLASS INDUCED BY LINEAR ABSORPTION OF LASER RADIATION NON- Q-SPOILED A67-16794

LASER RADIATION EFFECT ON HEATING PROCESS AND GAS DYNAMIC MOTION OF FINITE TRANSPARENT GAS AND MOTIONLESS COLD GAS AT VACUUM INTERFACE A67-17008

MULTIPHOTON IONIZATION OF KRYPTON ATOM BY RUBY LASER RADIATION A67-18796

MICRO- AND MACROCRACK FORMATION IN ORGANIC GLASS BY FOCUSING OF LASER BEAM A67-18808

## RADIATION EMISSION

RAMAN LIGHT FORWARD EMISSION IN LIQUIDS WHEN ILLUMINATED BY LASER, OBTAINING STIMULATED RAMAN ACTION WITHOUT FEEDBACK, WHICH SUGGESTS EXISTENCE OF MECHANISM CONTRIBUTING TO MODULATION OF MEDIUM POLARIZABILITY A66-26160

SPECTRAL ANALYSIS OF EMISSION OF SPATIALLY SEPARATED SPOTS IN GA AS INJECTION LASERS A67-20185

## RADIATION FIELD

MODELS OF MATTER-ELECTROMAGNETIC FIELD INTERACTION FOR GAS LASERS, USING PERTURBATION THEORY A66-26216

QUANTUM THEORY OF Q-SPOILED LASER, NOTING STATISTICS OF NUMBER OF PHOTONS IN MODE BEAR QUALITATIVE RESEMBLANCE TO POISSON STATISTICS A66-41373

ESTIMATED GREATEST PERMISSIBLE MIRROR MISALIGNMENT, ACTIVE MEDIUM INHOMOGENEITY AND EXTRA-AXIAL BEAM LOSSES FOR ARTIFICIAL REALIZATION OF VERY NARROW RADIATION PATTERN IN REAL LASER A66-41449

LASER MODEL OF N TWO-LEVEL SYSTEMS INTERACTING WITH RADIATION FIELD - BIBLIOGRAPHY AFCRL-66-166 N66-29246

ESTIMATED GREATEST PERMISSIBLE MIRROR MISALIGNMENT, ACTIVE MEDIUM INHOMOGENEITY AND EXTRA-AXIAL BEAM LOSSES FOR ARTIFICIAL REALIZATION OF VERY NARROW RADIATION PATTERN IN REAL LASER A67-14185

ACCURACY AND LIMIT ANALYSIS OF STATISTICAL DISTRIBUTION OF EM RADIATION FIELD BY PHOTOELECTRON COUNTING DISTRIBUTIONS FROM PHOTODETECTOR FOR SINGLE MODE LASER NEAR THRESHOLD A67-16624

MULTIPHOTON ABSORPTION PROCESSES, COHERENCE OF RADIATION FIELDS AND STATISTICAL PROPERTIES OF LASER LIGHT ABSORPTION A67-16681

## RADIATION INTENSITY

SINGLE PULSE OPERATION OF LASERS, NOTING ENERGY STORAGE AND AMPLIFICATION EFFECT FOR FOUR- AND THREE-LEVEL ACTIVE MEDIUM A66-39711

DETECTION OF SURFACE SCATTERED LIGHT BY LASER RADIATION AFWL-TR-65-220 N66-24735

## RADIATION MEASUREMENT

CD S SINGLE CRYSTAL OPTICAL GENERATOR DURING EXCITATION BY RUBY LASER, DISCUSSING TWO-PHOTON ABSORPTION COEFFICIENT AT 300 DEGREES K FOR RADIATION FLUX DENSITIES A66-27576

MEASURING DEVICE FOR PULSED LASER OUTPUT POWER USING BOLTOMETER, AMPLIFIER AND OSCILLOSCOPE A66-29701

MEASUREMENT OF RADIATION PATTERN OF RUBY LASER EMISSION FOR VARIOUS RESONATORS AND OPERATING REGIMES, NOTING LASER EFFECT ON ANGULAR HALF-WIDTH VALUES A66-30847

MATHEMATICAL FORMULAS TO DETERMINE RADIATION LOSS MEASUREMENT IN RUBY LASER TG-230-T468 N66-34235

## RADIATION PROTECTION

LASER SAFETY STANDARDS, DISCUSSING NATURE OF PHOTOBIOLOGICAL MECHANISMS RESPONSIBLE FOR TISSUE DAMAGE UPON EXPOSURE TO LASER RADIATION A66-27775

LASER GIANT PULSE DAMAGE TO DIELECTRIC MIRROR COATINGS IMMERSSED IN NITROBENZENE SOLUTION A66-36075

TISSUE DESTRUCTION BY LASER RADIATION, ITS MANAGEMENT AND PREVENTIVE MEASURES A66-81926



**RADIATION SHIELDING**

SAFETY PROGRAM FOR LASER HAZARDS, DISCUSSING EYE AND BODY PROTECTION A67-19089

**RADIATION SPECTRUM**

ANGULAR DISTRIBUTION OF STIMULATED RAMAN RADIATION, DISCUSSING AXIAL AND OFF-AXIAL STOKES AND SURFACE RADIATION MECHANISM A66-25189

STATISTICAL EFFECTS DURING GENERATION OF SECOND HARMONIC IN OPTICALLY TRANSPARENT CRYSTALS, NOTING COEFFICIENT OF CORRELATION BETWEEN HARMONIC AND FUNDAMENTAL RADIATION POWER OF SOLID STATE LASER A66-31167

X UV C, TI, MN, FE, NI, CU, ZN AND AR LINE SPECTRA AND CONTINUUM RADIATION SPECTRA IN PLASMAS PRODUCED BY FOCUSED RUBY LASER BEAM A66-39812

STATISTICAL EFFECTS DURING GENERATION OF SECOND HARMONIC IN OPTICALLY TRANSPARENT CRYSTALS, NOTING COEFFICIENT OF CORRELATION BETWEEN HARMONIC AND FUNDAMENTAL RADIATION POWER OF SOLID STATE LASER A67-12928

DYNAMICS OF NARROWING EFFECT OF SURFACE AND SPATIAL DISPERSING AGENTS ON RADIATION LINE OF RUBY LASER WITH NONRESONANCE FEEDBACK A67-18797

SUM RADIATION FREQUENCY GENERATION BY RUBY AND NEODYMIUM LASERS IN KDP CRYSTALS A67-19734

**RADIATION TRANSFER**

EXCITATION RADIATION TRANSFER FROM TRIVALENT CHROMIUM TO NEODYMIUM EXAMINED VIA FLUORESCENCE SPECTROSCOPY, NOTING ENERGY TRANSFER PARAMETERS AND EFFECT ON LASER OUTPUT A66-26175

**RADIATIVE RECOMBINATION**

IN AS LASER EMISSION, DISCUSSING RADIATIVE TRANSITIONS, COHERENT EMISSION FROM IN AS DIODES, RECOMBINATION MECHANISMS IN IR RADIATION SPECTRA, ETC A66-25065

RELAXATION TIME FOR RECOMBINATION RADIATION FROM SEMICONDUCTOR SOURCE DETERMINED BY MEASURING CURRENT/EMISSION PHASE SHIFT A66-29704

MULTIPHOTON PLASMA PRODUCTION AND STIMULATED RECOMBINATION RADIATION IN LEAD TELLURIDE, CONSIDERING ELECTRON-HOLE PAIR PRODUCTION RATE A66-31884

RECOMBINATION RADIATION FROM GA AS P-N JUNCTIONS WITH AND WITHOUT FABRY-PEROT RESONATOR, NOTING PARAMETER DEPENDENCE ON CURRENT DENSITY A66-40314

SHALLOW DONOR INTRODUCTION IN P-TYPE GA-AS LASER RESULTS IN INCREASED EFFICIENCY OF RADIATIVE RECOMBINATION A67-17280

RECOMBINATION RADIATION OF P-N JUNCTIONS IN GA AS WITH AND WITHOUT FABRY-PEROT CAVITY, DISCUSSING NONEQUILIBRIUM CURRENT CARRIER KINETICS AND I-V CHARACTERISTICS A67-18934

**RADIO COMMUNICATION**

BOOK ON LASER APPLICATIONS IN RADIO COMMUNICATION SYSTEMS A66-43226

**RADIO ELECTRONICS**

RADIO ELECTRONICS, DISCUSSING QUANTUM ELECTRONICS, LASERS, MICROWAVE DEVICES AND TECHNOLOGY, PLASMA PHYSICS, ETC A67-18072

LOW NOISE AMPLIFIERS, LASER RADAR OPTICS, GAS LASERS AND HOLOGRAPHY, AND MICROMINIATURIZED SOLID STATE DEVICES FOR RADIO ELECTRONICS N67-16009

**RADIO FREQUENCY**

HALATION OF PHOTOIONIZATION OF LIGHT SPARK INVESTIGATED, USING SUPER HIGH FREQUENCY RADIO RADIATION, FOR RUBY LASER

TT-66-61469

N66-34061

GAS LASER PUMPED MICROWAVE EMISSION FOR PRODUCING CONTROLLED EXCITED STATE POPULATION FOR RF SPECTROSCOPY OF NEON A67-16638

**RADIO FREQUENCY DISCHARGE**

POWER ENHANCEMENT IN PULSED HE-NE LASERS, NOTING OVERSHOOTING FOR RF DISCHARGE MODULATION WITH SQUARE WAVE A66-32963

LASER ACTION DELAY DUE TO PLASMA-TUBE-SURFACE DECOMPOSITION RESULTING FROM BOMBARDMENT BY NEON IONS A67-15110

**RADIO FREQUENCY RADIATION**

INTERNAL PHASE MODULATION IN HE-NE LASER USING ELECTRO-OPTIC EFFECT IN CRYSTAL QUARTZ, OBSERVING SPECTRUM AND RF MODE BEATS A66-32621

COHERENT AMPLIFICATION OF RF RADIATION IN COSMIC SPACE A66-42754

COHERENT AMPLIFICATION OF RF RADIATION IN COSMIC SPACE A67-10836

**RADIO INTERFEROMETER**

TRAVELING WAVE MASER FOR RADIO ASTRONOMY INTERFEROMETER NOTING SUPERCONDUCTING MAGNET, DYNAMO AND CRYOSTAT A67-20115

**RADIO RECEIVER**

FUTURE PROSPECTS OF LASER AS LIGHT COMMUNICATIONS DEVICE AND RADIO RECEIVER JPRS-36111 N66-29552

**RADIO SIGNAL PROPAGATION**

COMMUNICATION SYSTEM RESEARCH ON HYDROGEN MASER, SOLID STATE IMAGE CONVERTER, AND TELEMETRY SIGNAL PROPAGATION NASA-TM-X-53535 N67-16724

**RADIO TRANSMISSION**

ABSTRACTS OF 15 ARTICLES ON ELECTRONICS, MASERS, SEMICONDUCTOR DEVICES, AND RADIO AND OTHER TRANSMISSION SYSTEMS TAKEN FROM CHINESE PEOPLES REPUBLIC OPEN LITERATURE ATD 66-6 N66-28300

**RADIOACTIVE DECAY**

GAS LASER SPECTROSCOPIC ANALYSIS OF HYPERFINE STRUCTURE, PARAMAGNETIC PROPERTIES, RADIATIVE LIFETIMES AND DOPPLER-BROADENED TRANSITION SATURATION BEHAVIOR OF EXCITED STATES OF Xe 129 A67-15462

**RADIOACTIVE ISOTOPE**

FISSION OR RADIOISOTOPIC NUCLEAR RADIATION APPLIED TO LASER PUMPING, DISCUSSING FORMS, SOURCES, POWER, SOLID STATE AND MOLECULAR GAS LASERS, ENERGY TRANSFER, OPTICAL FLUORESCENCE AND CUT-OFF PHENOMENON A67-16547

**RAMAN EFFECT**

STIMULATED RAMAN EFFECT AND TUNABILITY OF RAMAN LASER A66-25062

ANGULAR DISTRIBUTION OF STIMULATED RAMAN RADIATION, DISCUSSING AXIAL AND OFF-AXIAL STOKES AND SURFACE RADIATION MECHANISM A66-25189

NONLINEAR QUANTUM EFFECT IN SOLID STATE LASERS USING PARAMAGNETIC CRYSTALS, NOTING RAMAN EFFECT AND GAIN DEPENDENCE ON PUMPING POWER A66-26172

LASER FREQUENCY TUNING BY DIELECTRIC MATERIAL INTERACTION TO PRODUCE NONLINEAR EFFECTS A66-26867

STIMULATED RAMAN EFFECT IN ACETONE AND ACETONE-CARBON DISULFIDE MIXTURES, NOTING SIMILARITY OF STOKES RADIATION PATTERN TO RAMAN EFFECT A66-28881

LENGTH DEPENDENT THRESHOLD DATA FOR STIMULATED RAMAN EMISSION IN LIQUIDS, NOTING CORRELATION BETWEEN LASER BEAM SELF-FOCUSING AND ONSET OF

- RAMAN EMISSION A66-30157
- COUPLING OF ADJACENT AXIAL MODES IN EXTERNAL RAMAN RESONATOR OBSERVED AS FIRST STOKES FREQUENCY WITH BENZENE AS RAMAN MEDIUM AND Q-SWITCHED RUBY LASER AS PUMP SOURCE A66-39109
- MOLECULAR OSCILLATION DIFFERENCE FREQUENCY GENERATION IN IR SPECTRUM BY BEATING TOGETHER LASER AND LASER-STIMULATED RAMAN EMISSION A66-42544
- NEW CLASS LIGHT FILAMENT IDENTIFIED IN RAMAN RADIATION OF INTENSE RUBY LASER BEAM NASA-TM-X-57831 N66-33863
- STIMULATED RAMAN EFFECT IN LIQUID STANNIC CHLORIDE AND METHANE GAS USING MEDIUM POWER RUBY LASER N66-35532
- STIMULATED STOKES EMISSIONS FROM RAMAN ACTIVE MEDIA OBSERVED BY USING Q-SWITCHED RUBY LASER WHICH EMITS MULTIPLE PULSE IN EACH SHOT A67-14765
- RAMAN SCATTERING**
- LIGHT FREQUENCY MULTIPLIERS FOR NONLINEAR OPTICAL EFFECTS AT VARIOUS WAVELENGTHS, CONSIDERING FOCUSING, LASER BEAM FINITE DIVERGENCE, AIR BREAKDOWN, STIMULATED RAMAN EMISSION, ETC A66-26146
- COUPLED WAVE FORMALISM, GIVING UNIFIED DESCRIPTION OF PARAMETRIC DOWN CONVERSION OF LIGHT, STIMULATED BRILLOUIN AND RAMAN EFFECTS, ETC, STRESSING EXPONENTIAL CHARACTER OF GAIN A66-26156
- DISCREPANCY BETWEEN CALCULATED AND EXPERIMENTAL VALUES FOR RAMAN GAIN IN PULSED LASER SUGGESTS HIGHER ENERGY DISTRIBUTION DUE TO LIGHT TRAPPING OR BRILLOUIN SCATTERING A66-26157
- EFFECT OF FLUCTUATING LASER PUMP ON STIMULATED RAMAN SCATTERING, NOTING GROWTH OF COUPLED STOKES-ANTI-STOKES WAVES IN PRESENCE OF TWO-MODE PUMP A66-26158
- RAMAN LIGHT FORWARD EMISSION IN LIQUIDS WHEN ILLUMINATED BY LASER, OBTAINING STIMULATED RAMAN ACTION WITHOUT FEEDBACK, WHICH SUGGESTS EXISTENCE OF MECHANISM CONTRIBUTING TO MODULATION OF MEDIUM POLARIZABILITY A66-26160
- INTERACTION BETWEEN STIMULATED BRILLOUIN AND RAMAN SCATTERING IN CARBON SULFIDE, USING OPTICAL RESONATOR AND LASER BEAM A66-26162
- SELECTIVE FEEDBACK AND SATURATION MECHANISMS OF RAMAN LASERS USING SECONDARY RAMAN LINES, EMPHASIZING CYCLOHEXANE A66-37777
- QUENCHING OF STIMULATED RAMAN SCATTERING OF COHERENT RADIATION BY TWO-PHOTON ABSORPTION IN ORGANIC LIQUIDS A66-43039
- RAMAN SCATTERING STUDIES USING CONTINUOUS WAVE OPTICAL MASERS AND SPECTROMETERS MIT-DSR-4979 N66-27897
- FEASIBILITY OF USING FLUORESCING DYES PUMPED WITH RUBY LASER FOR LOWER THRESHOLDS THAN RAMAN TYPE LASERS AD-636953 N66-38187
- SUM AND DIFFERENCE FREQUENCY MIXING OF VISIBLE AND IR GAS LASER LIGHT IN GA P AT NEAR RESTSTRAHL FREQUENCIES AND RELATIONSHIP TO SPONTANEOUS RAMAN SCATTERING A67-15464
- POLARIZATION OF LIGHT SCATTERED FROM HE- NE LASER BEAM, APPLYING QUANTUM THEORY TO FORMULA FOR DEPOLARIZATION RATIO A67-15624
- PROPERTIES OF SELF-TRAPPED LIGHT FILAMENTS NOTING STIMULATED RAMAN EMISSION AND CREATION, CONTAINMENT AND TERMINATION MECHANISMS A67-16648
- TUNABLE RAMAN LASER OBTAINED BY ELECTRON MOBILITY SUBJECTED TO MAGNETIC FIELD, NOTING THRESHOLD PUMP POWER A67-16684
- LASER EXCITED RAMAN SCATTERING STUDIED AS MEANS FOR INVESTIGATING CRYSTALS CONTAINING IMPURITIES AD-637256 N67-11104
- RAMAN GENERATOR FOR AMPLIFICATION OF COHERENT RADIATION, AND SPECTRAL CHARACTERISTICS OF GAS LASER WITH ONE DIRECTION TRAVELING WAVE PROPAGATION FTD-MT-65-399 N67-11313
- RAMAN GENERATOR FOR AMPLIFICATION AND GENERATION OF COHERENT RADIATION N67-11314
- RAMAN SPECTROSCOPY**
- LASER BEAM DETERIORATION AND STIMULATED RAMAN EFFECT AD-628074 N66-24738
- CONVERSION EFFICIENCY AND THRESHOLD OF STIMULATED RAMAN EMISSION IN BENZENE, NITROBENZENE, TOLUENE, AND CARBON DISULFIDE - DEFENDER PROJECT A056-F N66-36239
- HIGH ENERGY DIFFRACTION LIMITED RAMAN LASER REALIZATION STUDIES AD-636250 N66-37176
- C W HE- NE LASER COMPARED WITH MERCURY ARC SOURCE, OBTAINING RAMAN SPECTRA OF CARBON TETRACHLORIDE BY THREE METHODS OF EXCITATION A67-13912
- RAMAN SPECTRUM**
- RAMAN DIFFUSION SPECTRA FROM CRYSTALS EXCITED BY GAS LASER A66-26345
- EFFECT OF POWER AND PATH LENGTH ON THRESHOLD FOR STIMULATED RAMAN SPECTRA N66-35535
- LASER EXCITED ELECTRONIC RAMAN SPECTRUM OF TRIVALENT EU ION DOPED Y GA GARNET A67-11084
- SECOND HARMONIC GENERATIONS AND MIXINGS OF RAMAN LINES PRODUCED IN CYCLOHEXANE, ACETONE, BENZENE AND CARBON DISULFIDE, PHOTOGRAPHING FIRST ORDER STOKES RADIATION A67-12052
- RAMAN NOISE**
- LINE WIDTH OF WELL-STABILIZED LASER OPERATING FAR ABOVE THRESHOLD DETERMINED BY PHASE RANDOM FLUCTUATION, USING INTERFEROMETER A66-39394
- RANDOM PROCESS**
- SPATIAL SELECTIVE FADING AS RANDOM PROCESS, DISCUSSING SPATIAL COHERENCE, WAVE NUMBER DISPERSION PROFILE, TIME DELAY PROFILE, ETC, IN IONOSPHERIC PROPAGATION A66-26859
- SCATTERING OF PARTIALLY COHERENT RADIATION BY NEUTRAL MOLECULES FORMULATED AS RANDOM PROCESS A67-12096
- RANGE AND RANGE RATE TRACKING**
- DIGITAL-MODE FM CW LASER RANGING AND TRACKING SYSTEM USING COMPOUND AXIS SERVOMECHANISM A66-25982
- RANGE MEASUREMENT**
- SATELLITE RANGE MEASUREMENTS USING LASER IN CONJUNCTION WITH PHOTOELECTRIC RECEIVER AND BAKER- NUNN CAMERA A66-29998
- LASER SYSTEM FOR MEASURING SURFACE CONTOURS IN LARGE STEERABLE ANTENNAS A66-34296
- HELIUM-NEON LASER ASSESSMENT AS SOURCE IN HIGH PRECISION RANGE MEASUREMENTS A66-35362
- RANGEFINDING**
- SMALL LASER RADAR APPLIED TO METEOROLOGICAL STUDIES PMR-TM-66-6 N67-12294

- GALLIUM ARSENIDE LASER RADAR AND RANGEFINDING AT ROOM TEMPERATURE  
HDL-TM-66-13 N67-16144
- RARE EARTH**  
COHERENT EMISSION FROM TRIVALENT HOLMIUM IONS IN RARE EARTH SUBSTITUTED YTTRIUM ALUMINUM GARNET, NOTING THREE ENERGY TRANSFER COMBINATIONS IN YAG  
A66-28690
- GROWTH OF SINGLE CRYSTALS OF RARE-EARTH FLUORIDES FOR LASER APPLICATION, USING HYDROGEN FLUORIDE ATMOSPHERE, NOTING ION EXCHANGE PURIFICATION  
A66-31082
- FLUORESCENCE OF RARE EARTH, ACTINIDE AND TRANSITION METAL IONS IN INSULATING CRYSTALS AS RESULT OF OPTICAL EXCITATION, DISCUSSING SPECTROSCOPIC PROPERTIES AND OPERATING CHARACTERISTICS  
A66-36969
- ORGANIC LASER SYSTEMS INCLUDING LUMINESCENCE FOR ACHIEVING LASER ACTION, FLUORESCENT AND PHOSPHORESCENT SYSTEMS AND CHEMISTRY AND SPECTROSCOPIC PROPERTIES OF RARE EARTH CHELATES  
A66-36970
- CRYSTALLINE SOLID LASERS, CONSIDERING RARE EARTH AND TRANSITION METAL IMPURITIES AND HOST MATERIALS, NOTING CW LASER CHARACTERISTICS  
A66-42799
- NEODYMIUM DOPED OPTICAL GLASSES FOR LASER TECHNOLOGY  
A67-16855
- SYNTHESIS OF MODEL COMPOUNDS AND INTRAMOLECULAR ENERGY TRANSFER FOR ORGANIC LASER MATERIALS, AND SENSITIVE RARE EARTH FLUORESCENCE IN ORGANIC SOLVENTS  
NASA-CR-81780 N67-18123
- RARE EARTH COMPOUND**  
THEORETICAL OPTICAL RESONATOR FOR LASER WITH RARE EARTH LIQUID SOLUTIONS AS ACTIVE COMPONENTS  
A66-39549
- RARE GAS**  
LASER PUMPING BY INTENSE NOBLE GAS DISCHARGE IN ZETA-PINCH GEOMETRY  
A66-25995
- ATOMIC IONIZATION BY INTENSE OPTICAL FIELD, NOTING RUBY LASER-PULSE EFFECT ON INERT GAS BETWEEN ELECTRODES  
A66-26189
- THRESHOLD DATA FOR RUBY AND NEODYMIUM LASER PULSE-INDUCED BREAKDOWN IN Xe, Ar, Kr, Ne, He, OXYGEN, NITROGEN, AIR AND CARBON DIOXIDE  
A66-26191
- LASER OSCILLATOR STUDY OF COHERENT STIMULATED EMISSION OF IR TRANSITIONS IN RARE GASES  
A66-27336
- RADIATIVE CASCADE PATTERNS IN HELIUM-NEON GAS SYSTEM USING IDEALIZED MODEL, COMPUTING SPONTANEOUS DECAYS WHICH ARE COMPARED WITH LASER EXPERIMENTS  
A66-28699
- ACTUAL LINE SHAPE EXPECTED FROM ACCELERATING RADIATING ION, ERRORS DUE TO LORENTZIAN APPROXIMATION AND RESULTS FOR ION LASER TRANSITION IN RARE GAS LASERS  
A66-30181
- HIGH VOLTAGE PULSED ELECTRODELESS DISCHARGE IN RARE GAS AS LIGHT SOURCE FOR RUBY AND NO GLASS LASER EXCITATION AND OBSERVATION OF OUTPUT CHARACTERISTICS  
A66-31448
- OPTICAL FREQUENCY BREAKDOWN THRESHOLD OF INERT GAS MIXTURES, USING FOCUSED BEAM RADIATION FROM Q-SPOILED NEODYMIUM LASER  
A66-34236
- DECAY CROSS SECTION OF PUMPED METASTABLE HE ATOMS IN HE- NE LASER  
A66-34695
- RADIATION FROM HIGH-ENERGY-LEVEL TRANSITIONS EXCITED IN HE- NE LASER DURING OPTICAL PUMPING WITH HE LAMP  
A66-34697
- MULTIPHOTON IONIZATION OF KRYPTON AND ARGON BY RUBY LASER RADIATION MAY OCCUR BY ABSORPTION  
A66-36721
- CONTINUOUS WAVE UV IONIZED GAS LASER EMISSION OVER FOUR TRANSITIONS IN NEON, KRYPTON AND ARGON  
A66-37771
- DECAY CROSS SECTION OF PUMPED METASTABLE HE ATOMS IN HE NE LASER  
A67-10511
- RADIATION FROM HIGH ENERGY LEVEL TRANSITIONS EXCITED IN HE- NE LASER DURING OPTICAL PUMPING WITH HE LAMP  
A67-10513
- AMPLITUDE OF LF OSCILLATIONS IN HE- NE LASER  
A67-16948
- RAYLEIGH SCATTERING**  
VELOCITY AND LIFETIME OF MICROWAVE THERMAL PHONONS IN LIQUIDS AND SOLIDS DETERMINED BY SPECTRUM OF LIGHT SCATTERING FROM LASER ILLUMINATED SAMPLE  
A66-26166
- HIGH ALTITUDE ATMOSPHERIC SCATTERING OF INTENSE LIGHT FROM RUBY LASER BEAM INTERPRETED PRINCIPALLY IN TERMS OF RAYLEIGH SCATTERING FROM ATMOSPHERIC MOLECULES  
A67-19419
- READOUT**  
READOUT TECHNIQUE FOR LASER FOG DISDROMETER  
A66-33346
- RECEIVER**  
LARGE APERTURE TELESCOPE FOR USE AS COHERENT OPTICAL DEEP SPACE COMMUNICATIONS RECEIVER  
NASA-CR-81677 N67-17946
- RECEIVING SYSTEM**  
LOW NOISE RECEIVERS - TRAVELING WAVE MASER DEVELOPMENT  
N67-15913
- RECIRCULATIVE FLUID FLOW**  
RECIRCULATION OF LIQUID THROUGH CELL AND EXTERNAL HEAT EXCHANGER TO SOLVE PROBLEM OF REPEATED FLASHING IN EUROPIUM CHELATE LASERS  
A66-39108
- RECOMBINATION COEFFICIENT**  
SOLID STATE REDUCTION OF LANTHANIDE IONS IN LASER HOSTS, EFFECT OF PRESENCE OF RECOMBINATION HOLE-CENTERS IN PHOTOREDUCTION SAMPLES AND ELIMINATION DURING ELECTROCHEMICAL PROCESS  
A66-27464
- RECORDING INSTRUMENT**  
THERMAL HIGH RESOLUTION RECORDING USING MOVING LASER SPOT ON METALLIC AND ORGANIC THIN FILMS  
A67-16586
- RECRYSTALLIZATION**  
LASER BEAM-INDUCED RECRYSTALLIZATION OF AMORPHOUS GE SEMICONDUCTOR THIN FILMS PREPARED BY THERMAL DEPOSITION ON GLASS  
A67-13839
- REFLECTED WAVE**  
SUBMILLIMETER WAVELENGTH ELECTRONIC DEVICES, EXAMINING DEVELOPMENT OF LASERS AND REFLECTED WAVE TUBES WITH OVERLAPPING EFFECTIVE WAVE RANGE  
A66-38004
- SUBMILLIMETER WAVELENGTH ELECTRONIC DEVICES, EXAMINING DEVELOPMENT OF LASERS AND REFLECTED WAVE TUBES WITH OVERLAPPING EFFECTIVE WAVE RANGE  
A67-17168
- REFLECTION COEFFICIENT**  
DYNAMICS OF FIELD AND GENERATION FREQUENCIES IN GIANT PULSE OF RUBY LASER WITH PASSIVE SHUTTER, USING SOLUTION OF CRYPTOCYANINE IN ETHANOL, NOTING MIRROR REFLECTION COEFFICIENT  
A66-29727
- REFLECTING MIRRORS IN LASER OSCILLATORS TREATED AS REFLECTING ELEMENTS AND TRANSDUCERS FOR COUPLING POWER FROM OSCILLATOR TO EXTERNAL SPACE  
A66-40184
- PASSIVE CORE FIBER LASER DOES NOT REMOVE COMPLETELY NEED FOR OPTICAL QUALITY IN CLADDING MATERIAL  
A67-16666

## REFLECTOR

POLARIZING PROPERTIES OF LASER REFLECTOR  
CONSISTING OF TWO IDENTICAL RECTANGULAR PRISMS  
A66-31803

POLARIZING PROPERTIES OF LASER REFLECTOR  
CONSISTING OF TWO IDENTICAL RECTANGULAR PRISMS  
A66-39105

REGENERATIVE RADIATION FROM NEON LINE IN HE- NE  
LASER, USING SPHERICAL REFLECTORS IN RESONATOR  
A67-13096

RESEARCH REPORTS ON PHYSICS OF LASER RADIATION,  
OPTICAL RADAR SYSTEMS, CORNER REFLECTOR ON LUNAR  
SURFACE, PHOTON CORRELATIONS AND COUNTING  
STATISTICS, AND COLD CATHODES FOR GAS LASERS  
NASA-CR-81248 N67-16014

## REFLECTOR SATELLITE SYSTEM

OPTICAL SATELLITE TRACKING ANALYSIS USING PULSED  
LASER REFLECTION N66-32076

## REFRACTIVE INDEX

OPTICAL RAY TRACING TO PREDICT FOCUSING  
CHARACTERISTICS OF LASER LIGHT IN REFRACTIVE  
TARGETS, CALCULATING HEATING EFFECTS IN TARGET,  
NOTING TARGET GEOMETRY, REFRACTIVE INDEX,  
THICKNESS OF SKIN LAYERS, ETC A66-25531

OPTICAL SYSTEM FOR SCHLIEREN RECORDING, DEFLECTION  
MAPPING, SHADOWGRAPHY AND INTERFEROMETRY ACHIEVED  
FOR LASER LIGHT, USED IN RECORDING OF REFRACTIVE  
INDEX FIELDS A66-26307

EFFECTS AND PARAMETERS INFLUENCING OPTICAL PATH  
LENGTH WITHIN PUMPING PROCESS IN RUBY AND DOPED  
GLASS LASER RODS A66-31443

FLUCTUATIONS IN MEAN REFRACTIVE INDEX OVER LONG  
PATH THROUGH TURBULENT ATMOSPHERE EXAMINED, USING  
MICHELSON INTERFEROMETER WITH HE- NE LASER  
SOURCE A66-32618

FAR-FIELD LIGHT EMISSION MODE PATTERN OF GA AS  
DIODE INJECTION LASERS, DIELECTRIC GRADIENT IN  
INVERSION LAYER AND REFRACTIVE INDEX IN JUNCTION  
A66-39743

RUBY LASER GENERATION FROM TWO R LINES BY  
PRISMATIC LIGHT DISPERSION IN RESONATOR  
A67-13095

LASERS USED TO EXTEND RF PLASMA DIAGNOSTIC  
PROCEDURES TO OPTICAL FREQUENCIES BY  
INTERFEROMETRIC AND THOMSON DIFFUSION METHODS  
A67-13474

SELF-FOCUSING DUE TO INTENSITY DEPENDENT ANOMALOUS  
DISPERSION EFFECT ON ELECTROMAGNETIC RADIATION,  
EMPHASIZING LASER RADIATION IN SATURATED  
AMPLIFYING MEDIUM A67-16649

FREQUENCY MODULATION OF GA AS SEMICONDUCTOR LASER  
BY ULTRASONIC WAVE MODULATION OF DIELECTRIC  
CONSTANT A67-16671

GAS LENS FOCUSING OF LIGHT BEAMS, USING HIGHLY  
TRANSPARENT GAS WITH WEAKLY VARYING REFRACTIVE  
INDEX TO GUIDE COHERENT TRANSMISSION WITH SMALL  
LOSSES A67-19789

## REFRIGERATOR

LOW TEMPERATURE TECHNIQUES IN SATELLITE  
COMMUNICATIONS SYSTEMS, NOTING MASER, COOLED  
PARAMETRIC AMPLIFIER AND TREND TOWARD CLOSED-CYCLE  
REFRIGERATORS A66-26104

DUAL CHANNEL TRAVELING WAVE MASER FOR INTEGRATION  
IN CLOSED CYCLE REFRIGERATOR N67-15908

## REGENERATION

REGENERATIVE RADIATION FROM NEON LINE IN HE- NE  
LASER, USING SPHERICAL REFLECTORS IN RESONATOR  
A67-13096

## REGENERATOR

NEODYMIUM-DOPED YTTRIUM-ALUMINUM GARNET CRYSTAL  
LASER OSCILLATOR AS REGENERATIVE AMPLIFIER OF

## NOISE

A66-26212

## RELATIVISTIC VELOCITY

INTERSTELLAR VEHICLE PROPELLED BY TERRESTRIAL  
LASER BEAM A66-35488

## RELATIVITY THEORY

PHYSICS LECTURE SUMMARIES INCLUDING LASER BEAMS,  
ELECTRON SCATTERING, PARAMAGNETIC RESONANCE,  
PARTICLE ABSORPTION, CHROMOSOMES, AND RELATIVITY  
ISS-66/19 N66-35043

## RELAXATION

EXCITATION AND RELAXATION MECHANISMS FOR CLOSED  
MOLECULAR GAS LASER A67-16631

## RELAXATION METHOD

MAGNETIC FIELD GRADIENT RELAXATION MECHANISM  
BY RANDOM EXCITATION OF TRANSITIONS IN F  
EQUALS 1 LEVEL OF GROUND STATE OF HYDROGEN  
ATOMS IN MASER A67-16635

## RELAXATION TIME

RELAXATION TIME FOR RECOMBINATION RADIATION FROM  
SEMICONDUCTOR SOURCE DETERMINED BY MEASURING  
CURRENT/EMISSION PHASE SHIFT A66-29704

SOLID LASER RADIATION OPERATING IN Q-SWITCHED  
RESONATOR REGIME NOTING EFFECT OF FINITE RATE OF  
SWITCHING, FINITENESS OF RELAXATION TIME,  
TRANSMISSION COEFFICIENT FACTOR, ETC A66-37142

TRANSIENTS AND STABILITY OF IDEALIZED TWO-LEVEL  
LASER SYSTEM, OBTAINING RATE EQUATION SOLUTION,  
NOTING CHARACTERIZATION BY RELAXATION TIMES  
A66-41034

PULSED INDUCED EMISSION IN HYDROGEN BEAM LASER FOR  
CASE OF TWO RELAXATION TIMES, DETERMINING  
POLARIZATION ONLY BY NUMBER OF ACTIVE PARTICLES IN  
RESONATOR A66-41091

## RELIEF MAP

GAS LASER USED TO DETERMINE RESIDUAL WEDGE ANGLE  
IN OPTICAL FLATS AND DIRECT DISPLAY OF RELIEF MAPS  
A66-35390

## RENDEZVOUS GUIDANCE SYSTEM

LASER GUIDANCE SYSTEM FOR RENDEZVOUS AND DOCKING  
PROVIDING DATA ACQUISITION FOR GUIDANCE COMPUTER  
A67-15663

## RESEARCH PROJECT

SOLID STATE DEVICE, LASER, MATERIALS, AND PHYSICS  
RESEARCH PROJECTS  
ESD-TDR-65-553 N66-23942

SOVIET QUANTUM ELECTRONICS RESEARCH  
ATD-66-97 N67-14312

## RESIDUAL GAS

Q-SWITCH PULSED RUBY LASER IRRADIATION-INDUCED  
CHEMICAL DISSOCIATION AND IONIZATION IN RESIDUAL  
GASES A66-42076

## RESOLUTION

TIME RESOLUTION OF LASER-INDUCED ELECTRON EMISSION  
FROM CESIUM DIODE AT HIGH LASER POWER  
A66-31135

## RESONANCE EFFECT

DOUBLE RESONANCE EFFECTS EXTENDED TO CASE OF  
STIMULATED EMISSION IN EXCITED STATES OF NEON,  
USING GAS LASER IN TRANSVERSE DC MAGNETIC FIELD  
A67-16645

DYNAMICS OF NARROWING EFFECT OF SURFACE AND  
SPATIAL DISPERSING AGENTS ON RADIATION LINE OF  
RUBY LASER WITH NONRESONANCE FEEDBACK  
A67-18797

## RESONANCE SCATTERING

C W ARGON ION LASER SCATTERING IN ARGON PLASMA,  
NOTING RESONANCE AND CORRELATION BETWEEN DATA AND  
PLASMA PROPERTIES A67-16665

## RESONANCE TESTING

STEADY STATE REGIME AND STABILITY OF TWO-PHOTON

- LASER, NOTING FIELD DEPENDENCE OF INTENSITY AND DURATION OF FREQUENCY PULSE AND RESONANCE EXCITATION CURVES A67-14745
- RESONANT CAVITY**  
PERTURBATION OF RUBY LASER BY VIBRATING ONE OF MIRRORS CONSTITUTING RESONANT CAVITY A66-42999
- LOSS MEASUREMENT FOR RUBY LASER RESONANT CAVITY, COMPARING THRESHOLDS FOR R SUB 1 AND R SUB 2 LINE OPERATION A67-16655
- RESONANT FREQUENCY**  
TWO-PHOTON LASER EXCITATION CONDITIONS DETERIORATED BY PRESENCE OF RESONATOR TUNED ON TRANSITION FREQUENCY BETWEEN OPERATING LEVELS OF MATTER A66-37143
- FREQUENCY DOUBLING IN RESONANCE LASER, OBTAINING SECOND HARMONIC FIELD FOR LASER RADIATION BY GIANT PULSES A66-37144
- RESONANT FREQUENCY EQUATIONS FOR OPTICAL MASER PHOTON RATE GYROSCOPE DESIGN NASA-CR-59820 N66-33372
- MATHEMATICAL DEVELOPMENT OF RESONANT FREQUENCIES OF ELECTROMAGNETIC CAVITY - EVALUATION OF OPTICAL MASER PHOTON RATE GYROSCOPE NASA-CR-59809 N66-33411
- TWO-FREQUENCY VOLUME RESONATOR WITH INDEPENDENT TUNING WITHIN WIDE FREQUENCY BAND A67-11911
- RUBY LASER WITH NONRESONANT FEEDBACK DUE TO RADIATION SCATTERING, SHOWING USE AS OPTICAL FREQUENCY STANDARD A67-16642
- RESONANCE-LIKE CHARACTERISTICS OF DIRECT MODULATION OF JUNCTION LASER WITH BIAS CURRENT ANALYZED BY RATE EQUATIONS A67-19800
- RESONATOR**  
SOLID LASER RADIATION OPERATING IN Q-SWITCHED RESONATOR REGIME NOTING EFFECT OF FINITE RATE OF SWITCHING, FINITENESS OF RELAXATION TIME, TRANSMISSION COEFFICIENT FACTOR, ETC A66-37142
- PROPERTIES OF FINITE CYLINDRICAL DIELECTRIC RESONATOR - LASER OPTICS TG-230-T465 N66-34543
- BEHAVIOR OF CIRCULAR DIELECTRIC RESONATOR UNDER SOME CRITICAL OPERATING CONDITIONS TG-230-T475 N66-34783
- SEMICONDUCTOR GALLIUM-ARSENIDE LASER WITH FLAT RESONATOR N66-36291
- EXPERIMENT WITH MICROWAVE OPEN RESONATOR OF FABRY-PEROT TYPE AFCRL-66-496 N66-38268
- NEODYMIUM GLASS LASER WITH SPHERICAL MIRROR RESONATOR IN STATIONARY REGIME A67-18783
- INTERFERENCE MEASUREMENT OF HOMOGENEITY OF RUBY RESONATOR FOR LASER FTD-TT-66-44 N67-11161
- PROBABILITY METHOD OF DETERMINING ENERGY LOSSES IN RUBY LASER WITH MISALIGNED RESONATORS FTD-HT-66-492 N67-19235
- RETINA**  
CHORIORETINAL LESION PRODUCED BY PULSED RUBY LASER BEAM AND COMPLEX CHANGES IN RETINAL EXCITABILITY IN CATS A66-31761
- LASER LESIONS-CHANGES IN RETINAL EXCITABILITY IN CATS A66-81614
- RETINAL LESIONS PRODUCED BY RUBY LASER IN RABBITS AND HUMANS A66-82224
- VISUAL ACUITY DECREMENT FROM LASER LESION IN FOVEA
- OF STUMP TAIL MACAQUE MONKEYS A67-16287
- RETINAL IMAGE**  
LASER RADIATION EFFECT ON EYE - RETINAL BURNS, IMAGERY, AND SAFETY PRESCRIPTION TDCK-46027 N66-39840
- RING DISCHARGE**  
RING LASER SENSOR PARAMETERS AND CHARACTERISTICS, NOTING APPLICATION TO MEASUREMENT OF ANGULAR RATE, MASS FLOW, NAVIGATION AND GUIDANCE A66-35533
- COUPLING BETWEEN OPPOSITELY DIRECTED TRAVELING WAVES IN HE-NE RING LASER IN FORM OF MUTUAL BACKSCATTERING OF ENERGY FROM EACH BEAM INTO DIRECTION OF OTHER A66-37778
- RING LASER ROTATION SENSING SYSTEM, EVALUATING ACCURACY LIMIT FOR MINIMIZED INACCURACY OF KNOWN SOURCES OF ERROR A67-13992
- ROCKET ENGINE**  
PARTICLE VELOCITY IN GAS PARTICLE TWO-PHASE NOZZLE EXPANSION USING GAS LASER AND FABRY-PEROT INTERFEROMETER FOR ROCKET ENGINE PROPULSION AIAA PAPER 66-522 A66-31500
- ROD**  
HEAT TRANSFER AND STRESS WAVE EVOLUTION PRIOR TO ABLATION AND THERMAL EQUILIBRIUM IN EXPOSURE OF SOLID AND LIQUID MATERIALS TO LASER SOURCES A66-32638
- ONE-DIMENSIONAL HEAT FLOW EQUATION FOR LIQUID NITROGEN END-COOLED RUBY LASER ROD A66-38386
- PRODUCTION ENGINEERING MEASURE FOR RUBY LASER RODS QPR-3 N67-15107
- ROOM TEMPERATURE**  
ROOM TEMPERATURE PERFORMANCE OF GA AS LASER DIODES, USING S C RS TO ACHIEVE HIGH PULSE REPETITION RATE A66-40175
- HIGH CURRENT SOLID STATE PULSER USED TO DRIVE INJECTION LASER FOR ROOM TEMPERATURE OPERATION ECOM-2753 N67-15343
- ROTATING MIRROR**  
TRAVELING WAVE BEATS CREATED BY RING LASER ON ROTATING PLATFORM, NOTING FREQUENCY DIVISION ROTATING RATE AND CAPTURE BAND PARAMETERS A66-25102
- LASER OSCILLATION WITH TOTALLY REFLECTING ROOF PRISM AS CAVITY, NOTING OUTPUT VS MIRROR ALIGNMENT FOR TWO ROTATION AXES A66-29414
- TRAVELING WAVE BEATS CREATED BY RING LASER ON ROTATING PLATFORM, NOTING FREQUENCY DIVISION ROTATING RATE AND CAPTURE BAND PARAMETERS A66-30281
- ROTATION**  
SAGNAC EFFECT - INTERFEROMETER OR RING LASER FOR ELECTROMAGNETIC SENSING OF ABSOLUTE ROTATION AFCRL-66-311 N66-39733
- AUDIO FREQUENCY PROPORTIONAL TO ROTATION RATE OF REENRANT LASER CAVITY SYSTEM DERIVED FROM SINGLE OUTPUT BEAM A67-11322
- RUBIDIUM**  
LIGHT SHIFT, LIGHT MODULATION AND PHASE PULLING IN OPTICALLY PUMPED RUBIDIUM MASER A66-26202
- RUBY**  
PHOTON ECHO, OPTICAL ANALOG OF SPIN ECHO, IN RUBY CRYSTALS, USING RUBY LASER AS EXCITATION SOURCE A66-26170
- LASER ACTION WITH NONRESONANT FEEDBACK USING HIGH GAIN RUBY CRYSTALS A66-30297
- RUBY PHOTOCONDUCTIVITY WHEN EXPOSED TO LASER

- IRRADIATION, NOTING OSCILLOGRAMS  
A66-33941
- GIANT PULSE LASER WITH HIGH REPETITION RATE FOR  
OPTICAL RANGING SYSTEMS  
NSF-P-9  
N66-36248
- MICROWAVE MIXING IN PARAMAGNETIC CRYSTAL USING  
TRAVELING WAVE MASER WITH RUBY AS MIXER ELEMENT,  
NOTING FREQUENCY CONVERSION  
A67-10003
- RUBY CRYSTALS GROWN BY CZOCHRALSKI TECHNIQUE  
USING INDUCTION HEATED IRIIDIUM CRUCIBLE, NOTING  
LASER OSCILLATIONS IN PULLED CRYSTALS  
A67-16975
- X-BAND RUBY MASER DESIGN WITH LIQUID HYDROGEN  
COOLING FOR HIGH GAIN AT LOW PUMPING POWER  
A67-19131
- CIRCULARLY POLARIZED LASER MODES IN RUBY LASER  
MATERIAL  
N67-17277
- RUBY LASER  
MULTIMODE RUBY RESONATOR OUTPUT AS AFFECTED BY  
MODE NUMBER AND MODE DEGENERACY  
A66-25043
- RUBY LASER AMPLIFIER DYNAMICS, NOTING AMPLIFICATION  
IN ENERGY GAIN REGIMES AND CORRELATION TO  
THEORETICAL EQUATIONS  
A66-25049
- CAVITY LOSS AND OPTIMUM REFLECTIVITY OF OUTPUT  
MIRROR IN RUBY LASER WITH EXTERNAL MIRROR  
A66-25187
- DEPOPULATION OF GROUND STATE CHROMIUM IONS IN RUBY  
UNDER OPTICAL PUMPING EXPLAINED VIA RATE EQUATIONS  
A66-25188
- RUBY LASER EXPERIMENT YIELDING GIANT PULSES BY  
SEPARATING MIRRORS FROM CRYSTALS  
A66-25684
- SPATIAL DISTRIBUTION OF ELECTRICAL FIELD OBTAINED  
BY FOCUSING RADIATION OF RUBY LASER  
A66-25967
- STIMULATED BRILLOUIN SCATTERING IN QUARTZ  
ANALYZED, NOTING AMPLIFICATION, STOKES WAVE  
GENERATION AND RUBY GAIN  
A66-26165
- PHOTON ECHO, OPTICAL ANALOG OF SPIN ECHO, IN RUBY  
CRYSTALS, USING RUBY LASER AS EXCITATION SOURCE  
A66-26170
- OPTICAL EMISSION FROM RUBY INDUCED BY SHORT  
PULSES OF RELATIVISTIC ELECTRONS IN WHICH  
ELECTRON-HOLE RECOMBINATION PRODUCES EXCITATION OF  
EMISSION  
A66-26173
- ABSORPTION BEHAVIOR OF OPTICALLY PUMPED RUBY ROD,  
NOTING AMPLIFICATION AT ROOM TEMPERATURE AND  
ABSORPTION AT CRYOGENIC TEMPERATURE  
A66-26174
- ATOMIC IONIZATION BY INTENSE OPTICAL FIELD, NOTING  
RUBY LASER-PULSE EFFECT ON INERT GAS BETWEEN  
ELECTRODES  
A66-26189
- THRESHOLD DATA FOR RUBY AND NEODYMIUM LASER  
PULSE-INDUCED BREAKDOWN IN Xe, Ar, Kr, Ne,  
He, OXYGEN, NITROGEN, AIR AND CARBON DIOXIDE  
A66-26191
- GIANT-PULSE LASER-INDUCED ATMOSPHERIC ELECTRIC  
BREAKDOWN CAUSING OPTICAL FREQUENCY DISCHARGE  
A66-26194
- RUBY LASER MONOCHROMATIC RADIATION SEPARATION BY  
TAPERED MULTIPLEX INTERFEROMETER WITH OPPOSITION  
DISPERSION  
A66-26471
- HIGH POWERED Q-SWITCHED RUBY LASER / LIDAR/ FOR  
METEOROLOGICAL APPLICATION, NOTING SYSTEM  
EQUATIONS, DESIGN, OPERATION, ETC  
A66-26548
- RELAXATION OSCILLATION IN SINGLE-MODE OPERATION OF  
ROOM-TEMPERATURE CW RUBY LASER  
A66-27026
- ABSORBER RELAXATION EFFECT ON PASSIVE Q-SWITCH  
PULSE LASER  
A66-27029
- RUBY LASER ENERGY REFLECTED OFF EXPLORER XXII  
SATELLITE  
A66-27054
- CO S SINGLE CRYSTAL OPTICAL GENERATOR DURING  
EXCITATION BY RUBY LASER, DISCUSSING TWO-PHOTON  
ABSORPTION COEFFICIENT AT 300 DEGREES K FOR  
RADIATION FLUX DENSITIES  
A66-27576
- PUMPING NEODYMIUM LASERS THROUGH USE OF COHERENT  
EMISSION OF RUBY LASERS, FINDING THRESHOLD ENERGY  
A66-27605
- AXIAL AND TRANSVERSE MODE SELECTION, EMISSION  
SPECTRUM AND TRANSIENT EMISSION BEHAVIOR OF  
CONFOCAL RUBY LASER OPERATED IN ELLIPSOIDAL  
PUMPING SYSTEM  
A66-27606
- LASER-GENERATION-TYPE LUMINESCENCE CD S- CD SE  
CRYSTALS EXPOSED TO DOUBLE PHOTON EXCITATION FROM  
RUBY LASER  
A66-27647
- RUBY PHOSPHORESCENCE UNDER INTENSE OPTICAL  
EXCITATION, INFERRING POSSIBLE RECOMBINATION  
CHARACTERISTICS FROM INITIAL BRIGHTNESS DECAY  
A66-28607
- TEMPERATURE SHIFT OF RUBY LASER EMISSION MEASURED  
INTERFEROMETRICALLY FOR TEMPERATURES BETWEEN 66  
AND 210 DEGREES K  
A66-28701
- Q-FACTOR MODULATION OF RUBY-LASER RESONATOR BY  
PHTHALOCYANINE SERIES  
A66-29353
- LASER Q-FACTOR MODULATION BY SPECTRAL ABSORPTION  
FILTERS WITH INVERSE BLEACHING  
A66-29354
- STIMULATED EMISSION FROM SAMARIUM-DOPED CALCIUM  
FLUORIDE CRYSTAL EXCITED BY RUBY LASER  
A66-29358
- PULSED LASER OPERATION IN WEDGE-SHAPED RUBY ROD  
AT ROOM TEMPERATURE  
A66-29415
- SCATTERING OF LIGHT FROM PULSED RUBY LASER BY  
PLASMA JET, NOTING CROSS SECTION, ELECTRON-PHONON  
INTERACTION, ETC  
A66-30139
- COOPERATIVE INTERACTIONS BETWEEN IONS AND  
ELECTRONS IN FORWARD SCATTERING OF RUBY LASER BEAM  
FROM PLASMA  
A66-30153
- HIGH SPEED STROBOSCOPIC PHOTOGRAPHY USING KERR  
CELL MODULATED LASER SOURCE  
A66-30828
- MEASUREMENT OF RADIATION PATTERN OF RUBY LASER  
EMISSION FOR VARIOUS RESONATORS AND OPERATING  
REGIMES, NOTING LASER EFFECT ON ANGULAR HALF-  
WIDTH VALUES  
A66-30847
- MULTIPLEX LIGHT FILTER FOR EXCITATION OF RUBY  
LASER  
A66-30853
- RESONATOR TRANSIENTS USED TO SHORTEN GIANT LIGHT  
PULSES GENERATED IN Q-SWITCHED LASER OSCILLATORS  
TO PUMP SECONDARY LASER OSCILLATOR WITH SUITABLE  
ABSORPTION BAND  
A66-31077
- BEAM DIVERGENCE AND FAR FIELD PATTERNS IN RUBY  
LASERS  
A66-31098
- GIANT PULSES FROM NEODYMIUM GLASS LASER PUMPED BY  
GIANT PULSES FROM RUBY LASER  
A66-31354
- TRUNCATED EQUATIONS DESCRIBING COHERENT RADIATION  
OF EXCITED CHROMIUM IONS IN RUBY SITUATED IN  
TRAVELING WAVE RESONATOR  
A66-31547
- CHORIORETINAL LESION PRODUCED BY PULSED RUBY LASER  
BEAM AND COMPLEX CHANGES IN RETINAL EXCITABILITY  
IN CATS  
A66-31761
- OBTAINING HIGHLY MONOCHROMATIC RADIATION ON SINGLE  
WAVE FROM RUBY LASER  
A66-31809

NONLINEAR SCATTERING OF RUBY LASER BEAM BY PLASMA  
AT SECOND AND THIRD HARMONIC A66-32433

PHOTO EMF VARIATION WITH RADIATION POWER OF  
Q-SWITCH RUBY LASER INCIDENT ON SILICON CRYSTAL  
WITH P-N JUNCTION A66-32509

GENERATION IN CADMIUM SULFIDE DURING TWO-PHOTON  
OPTICAL EXCITATION BY RUBY LASER WITH MODULATED  
Q-FACTOR A66-33134

UPPER ATMOSPHERIC LIGHT SCATTERING OF VERTICALLY  
FIRED RUBY-LASER PULSE A66-33348

SPECTRAL DISTRIBUTION OF RUBY LUMINESCENCE YIELD,  
NOTING ABSORPTION COEFFICIENT AND EXCITATION  
BAND A66-33509

COHERENCE IN RADIATION PEAKS OF RUBY LASER STUDIED  
THROUGH INTERFERENCE FIELD A66-33510

RADIATION CONTROL OF RUBY LASER BY DIFFRACTION  
MODULATOR WITH TRAVELING ULTRASONIC WAVE, NOTING  
COMPUTER SOLUTION OF KINETIC EQUATIONS OF  
POPULATION BALANCE, RADIATION DENSITY,  
CHARACTERISTIC DAMPING, ETC A66-33515

EXPERIMENTAL STUDY OF EMISSION CONTROL IN RUBY  
LASER USING DIFFRACTION MODULATOR WITH MODULATED  
TRAVELING ULTRASONIC WAVE A66-33516

DYNAMIC PHOTOELASTICITY MEASUREMENTS OF STRESS  
CONCENTRATION, USING RUBY LASER MONOCHROMATIC  
LIGHT SOURCE A66-34557

LUNAR FIGURE AND ORBIT PARAMETERS MEASURED BY  
OPTICAL LOCATION METHOD A66-35285

PUMPING ENERGY DISTRIBUTION OF RUBY LASER,  
DISCUSSING EXISTENCE OF TRAPPED MODES AND EFFECT  
OF PARTIALLY FILLED WATER JACKET SURROUNDING RUBY  
RODS A66-35389

LASER ILLUMINATED ELECTRO-OPTICAL IMAGING NOTING  
ENERGY VARIATION PARAMETERS, EQUIPMENT USED AND  
RESULTS OBTAINED IN TV RECEPTION A66-35531

LASER APPLICATION SURVEY A66-35798

RESONANT BIREFRINGENCE IN POTASSIUM VAPOR UNDER  
INFLUENCE OF ELECTRIC FIELD OF RUBY LASER EMISSION  
A66-36066

OPERATION OF Q-SWITCHING DEVICE BASED ON  
FARADAY EFFECT AND USED WITH RUBY LASER FOR  
APPLICATION TO PLASMA DIAGNOSTICS A66-36079

MEASUREMENTS ON PHYSICAL AND LASER PROPERTIES OF  
VAPOR-GROWN RUBY SINGLE CRYSTALS PREPARED BY  
EPITAXIAL GROWTH A66-36081

HIGH TEMPERATURE HIGH-DENSITY PLASMA FROM SINGLE  
SOLID PARTICLE OF LITHIUM HYDRIDE SUSPENDED IN  
VACUUM, USING RUBY LASER IRRADIATION A66-36596

MULTIPHOTON IONIZATION OF KRYPTON AND ARGON BY  
RUBY LASER RADIATION MAY OCCUR BY ABSORPTION  
A66-36721

PULSED RUBY LASERS, CONSIDERING PUMPING AND  
THRESHOLD, OUTPUT, QUANTUM MECHANICS AND VARIATION  
ON BASIC DEVICE A66-36968

Q-SWITCHED RUBY LASER OUTPUT INCREASED BY USE OF  
SATURABLE DYE SOLUTION IN LASER CAVITY A66-37290

Q-FACTOR MODULATION OF RUBY-LASER RESONATOR BY  
PHTHALOCYANINE SERIES A66-37358

STIMULATED EMISSION FROM SAMARIUM-DOPED CALCIUM  
FLUORIDE CRYSTAL EXCITED BY RUBY LASER A66-37362

THRESHOLD DETERMINATION OF PULSED RUBY LASER BY  
SINGLE PULSE TECHNIQUE A66-37548

EIGENVALUES AND EIGENFUNCTIONS OF SPIN  
HAMILTONIAN AND MATRIX ELEMENTS OF SPIN OPERATOR  
OF RUBY A66-37584

IMPLOSION OF FAST NONPREIONIZED THETA PINCH  
STUDIED, USING FIRST AND SECOND HARMONIC OF RUBY  
LASER LIGHT A66-37638

RUBY LASER RADIATION EFFECT ON FLUORESCENCE AND  
LASER ACTION IN DYSPROSIUM DOPED CALCIUM FLUORIDE  
CRYSTALS A66-37656

HIGH POWER NONSPIKING OPERATION OF RUBY LASER FOR  
CONTINUOUS OUTPUT ON MICROSCOPIC AND MACROSCOPIC  
SCALE A66-38242

CONFOCAL RESONATOR THEORY INSTEAD OF DIFFRACTION  
AS EXPLANATION OF 90 DEGREE ROTATION BETWEEN NEAR  
AND FAR FIELDS OF RUBY LASERS A66-38243

ONE-DIMENSIONAL HEAT FLOW EQUATION FOR LIQUID  
NITROGEN END-COOLED RUBY LASER ROD A66-38386

UNFOCUSED RUBY LASER RADIATION FIELD-BIPHENYL  
COMPOUND INTERACTION, RESULTING LUMINESCENCE AND  
APPARENT MULTIPHOTON ABSORPTION A66-38528

PHOTOGRAPHIC RADAR SYSTEM EMPLOYING Q-SWITCHED  
RUBY LASER, MULLARD TYPE 6929 IMAGE TUBE AND  
CONVENTIONAL CAMERA A66-38796

COUPLING OF ADJACENT AXIAL MODES IN EXTERNAL  
RAMAN RESONATOR OBSERVED AS FIRST STOKES  
FREQUENCY WITH BENZENE AS RAMAN MEDIUM AND Q-  
SWITCHED RUBY LASER AS PUMP SOURCE A66-39109

MULTIPHOTON IONIZATION OF XENON ATOM IN POWERFUL  
ELECTRIC FIELD BY RUBY LASER RADIATION A66-39545

EXPERIMENTAL EXCITED STATE BAND LOCATIONS AND  
INTENSITIES IN ABSORPTION SPECTRUM OF ELECTRON  
TRANSITIONS IN OPTICALLY PUMPED RUBY LASER A66-39569

THEORETICAL EXCITED STATE ABSORPTION SPECTRUM OF  
ELECTRON TRANSITIONS IN OPTICALLY PUMPED RUBY  
LASER A66-39570

RUBY LASER PUMPING THRESHOLD ENERGY, DIVERGENCE  
ANGLE AND OUTPUT POWER AS AFFECTED BY RESONATOR  
LENGTH A66-39769

X UV C, TI, MN, FE, NI, CU, ZN AND AR LINE  
SPECTRA AND CONTINUUM RADIATION SPECTRA IN PLASMAS  
PRODUCED BY FOCUSED RUBY LASER BEAM A66-39812

SPECTRAL AND TIME-DEPENDENT CHARACTERISTICS OF  
STIMULATED RADIATION FROM RUBY PULSE LASER, USING  
FABRY-PEROT ETALON IN FINE-STRUCTURE OBSERVATION  
A66-39823

C W RUBY LASER OF 10-MM LENGTH IN ELLIPSOIDAL  
PUMPING SYSTEM UNDER WATER COOLING, NOTING VARIOUS  
MODES A66-40100

OPTICAL PROPERTIES OF CRYPTOCYANINE NOTING  
TRANSIENT DECAY OF FLUORESCENCE, USING RUBY LASER  
AND TRANSMISSION OF METHANOL SOLUTION A66-40103

RUBY LASER-INDUCED EFFECT OF PULSED PRESSURE ON  
KDP CRYSTAL SURFACE AND THERMAL BULK EFFECT ON  
EXCITATION OF ULTRASONIC OSCILLATION IN CRYSTAL  
A66-40318

RUBY LASER PUMPING SYSTEM AND LOW COST MERCURY  
FLASH TUBE WITH HIGH REPETITION RATES USED FOR  
MICROMACHINING PROCESS A66-40336

QUANTITATIVE PHOTOGRAPHIC DETERMINATIONS OF LASER  
BEAM POWER DENSITY DISTRIBUTIONS AND Q-SWITCHED  
RUBY OSCILLATOR-AMPLIFIER SYSTEM DIVERGENCE  
CHARACTERISTICS A66-41032

- INTERNAL SELF-DAMAGE IN 25 MW RUBY LASER  
OSCILLATOR ROD A66-41160
- CRYSTAL DEFECTS AND PERFORMANCE IN RUBY LASER,  
MEASURING COHERENCE FUNCTION OF LIGHT AND OUTPUT  
ENERGY AND CRYSTAL HOMOGENEITY A66-41291
- SPONTANEOUS EMISSION IN INVERSELY POPULATED MEDIUM  
EXAMINED FOR UNIFORM RUBY ROD LASER WITH UNIFORM  
PUMPING DISTRIBUTION A66-41450
- RUBY LASER GIANT PULSE OFF-AXIAL MODES DETECTED  
WITH HIGH RESOLUTION SPHERICAL FABRY-PEROT  
INTERFEROMETER A66-41627
- BIPOLAR NI-CD CELLS FOR RUBY LASERS AND POWER  
SOURCES TO YIELD HIGH ENERGY PULSES FOR FIRING  
PYROTECHNIC DEVICES A66-41760
- Q-SWITCH PULSED RUBY LASER IRRADIATION-INDUCED  
CHEMICAL DISSOCIATION AND IONIZATION IN RESIDUAL  
GASES A66-42076
- SPECTRAL DISTRIBUTION OF RUBY LUMINESCENCE YIELD,  
NOTING ABSORPTION COEFFICIENT AND EXCITATION BAND  
A66-42123
- COHERENCE IN RADIATION PEAKS OF RUBY LASER STUDIED  
THROUGH INTERFERENCE FIELD A66-42124
- RADIATION CONTROL OF RUBY LASER BY DIFFRACTION  
MODULATOR WITH TRAVELING ULTRASONIC WAVE, NOTING  
COMPUTER SOLUTION OF KINETIC EQUATIONS OF  
POPULATION BALANCE, RADIATION DENSITY,  
CHARACTERISTIC DAMPING, ETC A66-42128
- EXPERIMENTAL STUDY OF EMISSION CONTROL IN RUBY  
LASER USING DIFFRACTION MODULATOR WITH MODULATED  
TRAVELING ULTRASONIC WAVE A66-42129
- STIMULATED EMISSION OF POLYMETHINE DYES UPON  
PUMPING WITH Q-SWITCHED LASER, NOTING WAVELENGTH  
PARAMETERS AND OSCILLATION A66-42247
- SATURABLE DYES NOTING MODE SELECTION PROPERTIES  
AND ABSORPTION SPECTRA IN BLEACHED STATE A66-42253
- Q-SWITCHING LASER SYSTEM TO OBTAIN SIMULTANEOUS  
GIANT PULSES FROM FIVE RUBY LASER OSCILLATORS  
A66-42302
- FREQUENCY TEMPERATURE DEPENDENCE OF LONGITUDINAL  
AND TRANSVERSE HYPERSONIC WAVE ABSORPTION  
COEFFICIENTS IN QUARTZ AND ARTIFICIAL RUBY CRYSTAL  
A66-42514
- GIANT PULSE GENERATION RANGE IN TRANSVERSE  
DIRECTION AFTER Q-SWITCHING IN RUBY LASER,  
EXAMINING RESONATOR PROPERTIES A66-42516
- MODE SELECTION, RELAXATION OSCILLATIONS, MODE  
INTERACTION AND THERMAL EFFECTS IN ROOM  
TEMPERATURE CW LASERS IN ELLIPSOIDAL PUMPING  
SYSTEMS A66-42546
- PULSED RUBY LASER PHOTOELECTRIC RECEIVER  
EXPERIMENTS DETERMINING SATELLITE ORBITS,  
SUPPLEMENTING BAKER-NUNN CAMERA NETWORK  
A66-42547
- SINGLE TRANSVERSE AND LONGITUDINAL MODES OBSERVED  
IN OUTPUT OF PASSIVE Q-SWITCHED RUBY LASER WHEN  
TWO SPHERICAL MIRRORS ARE USED FOR RESONATOR  
A66-42563
- MODE COUPLING IN RUBY LASER WITH REACTANCE PLACED  
WITHIN CAVITY RESONATOR WITH MODULATION FREQUENCY  
CLOSE TO SEPARATION OF AXIAL MODES, EXAMINING  
ELECTRIC FIELD ENVELOPE A66-42565
- PERTURBATION OF RUBY LASER BY VIBRATING ONE OF  
MIRRORS CONSTITUTING RESONANT CAVITY A66-42999
- LASER LESIONS-CHANGES IN RETINAL EXCITABILITY IN  
CATS A66-81614
- ULTRAVIOLET RADIATION FOR RUBY LASER PUMPING, AND
- ENERGY TRANSFER PROCESSES BETWEEN ELECTRON  
ORBITS AND BETWEEN UNLIKE IONS  
ML-1393 N66-24104
- CONTROLLED THERMONUCLEAR STUDIES - CAULKED STUFFED  
CUSP MINIMUM- B MACHINE, SCYLLA OPERATION AND  
MEASUREMENTS, RUBY LASER TESTING, PLASMA GUNS,  
AND ELECTRIC AND MAGNETIC FIELD MEASUREMENTS  
LA-3434-MS N66-25226
- PHOTOGRAPHIC MEASUREMENT OF ENERGY DISTRIBUTION  
IN BEAM OF Q-SWITCHED RUBY LASER  
NASA-CR-75102 N66-26252
- THERMALLY INDUCED EFFECTS ON RUBY AND NEODYMIUM  
IN GLASS LASER RODS  
AFCRL-66-57 N66-26341
- RUBY LASERS IN SPACE COMMUNICATION  
FTD-TT-65-1683/164 N66-26501
- RUBY LASER WHICH PRODUCES TRIGGERABLE GIANT LASER  
PULSES BY Q-SWITCHING WITH SELECTIVE SATURABLE  
ORGANIC DYE  
IPP-4/34 N66-28336
- ION CURRENT PRODUCED BY ILLUMINATING MATERIALS  
WITH FOCUSED OUTPUT OF PULSED RUBY LASER  
NASA-CR-54154 N66-28382
- DYNAMIC OPTICAL PATH DISTORTION IN RUBY AND  
NEODYMIUM DOPED GLASS LASER RODS DUE TO  
EVOLUTION OF THERMAL GRADIENTS DURING OPTICAL  
PUMPING CYCLE N66-28554
- ANALYSIS AND STEADY STATE SOLUTION FOR USING ONE  
RUBY LASER ROD TO PUMP ANOTHER, IN ORDER TO  
REDUCE OPTICAL PATH DISTORTIONS N66-28555
- RUBY LASER WITH NONRESONANT FEEDBACK BY USING  
VOLUME OR SURFACE SCATTERER N66-28924
- DESCRIPTION OF RUBY LASER USED IN OPTICAL LOCATION  
OF MOON  
NASA-TT-F-8866 N66-29428
- Q-SWITCHED RUBY LASER USED TO EXPLODE PSEUDO-AIR  
TARGETS  
NOLTR-65-152 N66-29965
- SATURABLE OPTICAL FILTER IN LASER AMPLIFICATION  
CHAIN USED AS ISOLATOR TO LIMIT RADIANCE  
DEPUMPING EFFECTS  
AD-632007 N66-30020
- SPECTRAL AND MODE PROPERTIES OF RUBY, SOLID STATE,  
FABRY-PEROT, AND NEODYMIUM-DOPED YAG LASERS  
S-852 N66-30264
- PRODUCTION ENGINEERING MEASURE TO IMPROVE CRYSTAL  
QUALITY AND PRODUCTION YIELD OF RUBY LASER  
CRYSTAL GROWTH  
QPR-2 N66-30291
- RUBY LASER TO ILLUMINATE EXPLORER XXII SATELLITE  
WITH ENOUGH INTENSITY TO PHOTOGRAPH CUBE CORNER  
REFLECTORS LOCATED ON SATELLITE  
AFCRL-65-442 N66-31142
- PULSED RUBIDIUM LASER RANGE MEASUREMENTS WITH  
DELAYED SWEEP OSCILLOSCOPE, AND WITH DIGITAL  
READOUT SYSTEM N66-32075
- RUBY LASER USED IN VAPOR DEPOSITION OF THIN METAL  
FILMS  
UD-2037-E-1 N66-32219
- NEW CLASS LIGHT FILAMENT IDENTIFIED IN RAMAN  
RADIATION OF INTENSE RUBY LASER BEAM  
NASA-TM-X-57831 N66-33863
- HALATION OF PHOTOIONIZATION OF LIGHT SPARK  
INVESTIGATED, USING SUPER HIGH FREQUENCY RADIO  
RADIATION, FOR RUBY LASER  
TT-66-61469 N66-34061
- ABSORPTION COEFFICIENTS FOR ALPHA-POLARIZED  
RADIATION USING RUBY LASER AS COHERENT SOURCE AND



EBERT SPECTROMETER AS INCOHERENT SOURCE  
TR-4 N66-34159

MATHEMATICAL FORMULAS TO DETERMINE RADIATION  
LOSS MEASUREMENT IN RUBY LASER  
TG-230-T468 N66-34235

SPLITTING OF METASTABLE LEVEL OF THREE-LEVEL RUBY  
LASER  
TG-230-T467 N66-34267

MEASUREMENT OF EXCITED STATE ABSORPTION CROSS  
SECTION IN RUBY AT RUBY LASER WAVELENGTH  
GSP/PH/66-17 N66-34481

RANGE MEASUREMENTS OF GEOS-I AND BE-C SATELLITES  
WITH RUBY LASER  
NASA-CR-77292 N66-34634

DYNAMIC OPTICAL PROPERTIES OF LASER MATERIALS  
P66-134 N66-35125

FREQUENCY DISTRIBUTION MEASUREMENTS OF RUBY LASER  
LIGHT SCATTERED BY THETATRON PLASMA  
CLM-P-104 N66-35301

RUBY LASER INDUCED BREAKDOWN IN OXYGEN GAS AT HIGH  
PRESSURE N66-35531

STIMULATED RAMAN EFFECT IN LIQUID STANNIC  
CHLORIDE AND METHANE GAS USING MEDIUM POWER  
RUBY LASER N66-35532

EFFECT OF POWER AND PATH LENGTH ON THRESHOLD FOR  
STIMULATED RAMAN SPECTRA N66-35535

THERMALLY TUNED RUBY LASER RADAR FOR DETERMINING  
VERTICAL PROFILE OF ATMOSPHERIC WATER VAPOR  
TR-66-9 N66-35539

DOUBLE PULSE PUMPING OF RUBY LASERS FOR  
IMPROVEMENT OF LASER PERFORMANCE AND EFFICIENCY  
SA-TR20-9301 N66-35622

MANUFACTURING RESEARCH IN SUPPORT OF SATURN V -  
TIME-TEMPERATURE AS COMMON DENOMINATOR IN  
WELDING, PINK RUBY LASER FOR DRILLING AND  
WELDING, AND MAGNETIC-FIELD TOOLS  
NASA-TM-X-53505 N66-36420

PARTIALLY COHERENT LIGHT DIFFRACTION CALCULATIONS  
APPLIED TO RUBY LASER RADIATION  
TG-230-T478 N66-37071

MAXIMUM OUTPUT POWER FROM RUBY LASER AS FUNCTION  
OF PUMPING FOR SEVERAL INTERFEROMETER BASE  
VALUES  
TG-230-T479 N66-37072

DESIGNS OF QUANTUM ELECTRONIC SYSTEMS - RUBY  
LASERS, QUANTUM AND OPTICAL GENERATORS, OPTICAL  
GATES, WAVEGUIDES, ELECTROMAGNETIC WAVE  
PROPAGATION, AND COMMUNICATION SYSTEMS  
JPRS-37132 N66-37709

BIOLOGICAL EFFECTS AND DOSIMETRY OF ABSORBED  
RADIATION FROM RUBY LASER N66-37710

OPTIMUM OPERATING CONDITIONS OF RUBY LASER QUANTUM  
GENERATOR WITH PASSIVE SHUTTER N66-37711

CONCENTRATION OF CHROMIUM IONS IN RUBY LASER  
CRYSTAL LATTICE DETERMINED FROM RADIATION OUTPUT  
CHARACTERISTICS N66-37712

FLUX VELOCITY, CRYSTAL QUALITY AND DIAMETER,  
DISTRIBUTION OF CHROMIUM IONS, AND OTHER FACTORS  
CONSIDERED IN DESIGN OF RUBY LASER OPTICAL  
GENERATOR N66-37713

FEASIBILITY OF USING FLUORESCING DYES PUMPED WITH  
RUBY LASER FOR LOWER THRESHOLDS THAN RAMAN TYPE  
LASERS  
AD-636953 N66-38187

RUBY LASER MODE SELECTION AND PULSE AMPLIFICATION  
IPP-4/49 N66-38698

PROPERTIES OF URANYL-DOPED GLASS FOR APPLICATION

AS SATURABLE OPTICAL FILTER FOR USE WITH LASERS  
A67-10009

POLYMETHYLMETHACRYLATE AND POLYSTYRENE EXPOSURE  
TO RUBY AND NEODYMIUM-GLASS LASER RADIATION,  
NOTING APPEARANCE OF EPR A67-10075

C W LASER USING 3-INCH RUBY CRYSTALS WITH 15  
PERCENT MIRROR TRANSMISSION, PUMPING POWER OF  
DOUBLE THRESHOLD VALUE AND 1.6 WATT POWER OUTPUT  
A67-10244

APPROXIMATE ABSOLUTE VALUES OF PUMPING POWER,  
THRESHOLD POWER AND CRITICAL EXCESS POPULATION FOR  
RUBY LASER DETERMINED FROM RELATIVE FLASH TUBE  
INTENSITY MEASUREMENTS A67-10245

SCATTERED LIGHT SPECTRUM IN THETATRON PLASMA,  
NOTING ONSET OF ION WAVE INSTABILITY A67-10248

INTENSITY DEPENDENT FREQUENCY SHIFT IN SPECTRAL  
OUTPUT OF MONOCHROMATIC GIANT PULSE LASERS  
MEASURED, USING FABRY-PEROT INTERFEROMETER  
A67-10251

Q-SWITCHING OF RUBY LASER USING CELL CONTAINING  
CHLOROALUMINUM PHTHALOCYANINE IN CHLORONAPHTHALENE  
TO OBTAIN GIANT PULSES A67-10448

MOLECULAR SPECTROSCOPY OF ILLUMINATION EFFECTS ON  
COBALT ACTIVATED ZN S EXPOSED TO RUBY LASER  
PULSES A67-10683

RUBY LASER WITH SCATTERING INDUCED FEEDBACK AND  
ABSENCE OF RESONANCE TYPE OSCILLATIONS A67-10740

COUPLING MECHANISM IN PASSIVE Q-SWITCHING  
OPERATION BETWEEN FILAMENTS AT DIFFERENT REGIONS  
OF RUBY LASER ROD A67-10813

NARROW BEAM DIVERGENT Q-SWITCHED LASER PULSE  
GENERATION, NOTING OUTPUT CHARACTERISTICS AND  
APPLICATIONS A67-11024

LASER SATURATION OF PHOTOCONDUCTIVITY AND  
DETERMINATION OF IMPERFECTION PARAMETERS IN  
SENSITIVE PHOTOCONDUCTORS SUCH AS SINGLE CRYSTAL  
OF CADMIUM A67-11879

OUTPUT CHARACTERISTICS OF HALF-WAVE MODE KERR  
CELL RUBY OSCILLATOR USED AS OPTICAL RADAR FOR  
CLEAR AIR TURBULENCE / CAT/ DETECTION A67-12053

RUBY LASER WITH LIQUID FILTER, CONSIDERING  
RELATION BETWEEN FILTER EFFICIENCY AND ABSORPTION  
CURVE PARAMETERS WHEN ACTING AS Q-FACTOR  
MODULATOR A67-12423

SELF-FOCUSING OF RUBY LASER BEAM IN NA CL  
CRYSTALS A67-12481

Q-SPOILING OF RUBY LASER BY OPTICAL PUMPING IN  
INTENSE INHOMOGENEOUS MAGNETIC FIELD WITH  
REDUCED GAIN A67-12505

LOSSES IN RUBY LASER DETERMINED FROM DATA ON  
VARIATIONS IN BEAM DIVERGENCE ANGLE AND VARIATIONS  
IN LASING SPOT DIAMETER A67-12742

RUBY LASER PUMPING THRESHOLD ENERGY, DIVERGENCE  
ANGLE AND OUTPUT POWER AS AFFECTED BY RESONATOR  
LENGTH A67-12855

RUBY LASER FREQUENCY CONVERSION TECHNIQUE BY LASER  
BEAM SCATTERING AND MIXING OF COMBINED FREQUENCIES  
A67-13094

RUBY LASER GENERATION FROM TWO R LINES BY  
PRISMATIC LIGHT DISPERSION IN RESONATOR A67-13095

VOLUME DENSITY OF HEAT SOURCES IN RUBY LASER ROD  
BY NUMERICAL INTEGRATION OF PUMPING AND ABSORPTION  
SPECTRA A67-13117

FRACTURE MECHANISM OF TRANSPARENT CRYSTALS

- INTERACTING WITH RUBY LASER BEAM A67-13128
- LINEAR PHASE DISTORTIONS OF PLANE RESONATOR WITH TILTED MIRRORS AND EFFECTS ON GENERATION OF STIMULATED EMISSION IN RUBY CRYSTAL LASER A67-13130
- LUMINESCENCE IN CADMIUM SULFIDE MIXED CRYSTALS OF WIDELY VARYING COMPOSITION IN PRESENCE OF EXCITATION BY RUBY LASER EMISSION A67-13153
- SPONTANEOUS EMISSION IN INVERSELY POPULATED MEDIUM EXAMINED FOR UNIFORM RUBY ROD LASER WITH UNIFORM PUMPING DISTRIBUTION A67-14186
- STIMULATED STOKES EMISSIONS FROM RAMAN ACTIVE MEDIA OBSERVED BY USING Q-SWITCHED RUBY LASER WHICH EMITS MULTIPLE PULSE IN EACH SHOT A67-14765
- RUBY LASER AS ENERGY SOURCE FOR MEASURING THERMOPHYSICAL PROPERTIES OF MATERIALS VIA FLASH TECHNIQUE A67-15305
- MODULAR LIQUID-COOLED CYLINDRICAL RUBY LASER MICROWELDER DESIGN AND CONSTRUCTION A67-15310
- MULTIGIGAWATT OSCILLATOR-AMPLIFIER RUBY LASER SYSTEM FOR HIGH TEMPERATURE PLASMA RESEARCH ASME PAPER 66-WA/ENER-2 A67-15371
- POPULATION INVERSION VARIATION DURING LASER EMISSION AS SHOWN BY MEASUREMENTS OF FLUORESCENCE INTENSITY A67-15497
- ABRUPT TRANSMISSION CHANGE DURING RUBY LASER EMISSION RESULTING FROM PUMPING WITH XENON FLASH LAMP A67-15649
- DEGENERATE STIMULATED FOUR-PHOTON INTERACTION AND FOUR-WAVE PARAMETRIC AMPLIFICATION OBSERVED IN RUBY LASER AND LIQUID CELL ARRANGEMENTS A67-16379
- PHOTODETACHMENT PROBABILITY FOR CS AND NEGATIVE I DUE TO SIMULTANEOUS ABSORPTION OF TWO RUBY QUANTA A67-16627
- SEMICLASSICAL AND RATE EQUATIONS COMPARED FOR DETERMINATION OF OUTPUT POWER OF STEADY STATE RUBY LASER A67-16628
- RUBY LASER WITH NONRESONANT FEEDBACK DUE TO RADIATION SCATTERING, SHOWING USE AS OPTICAL FREQUENCY STANDARD A67-16642
- ELECTRON DENSITY, OPTICAL THICKNESS AND TEMPERATURE OF RUBY LASER-INDUCED CARBON PLASMA A67-16654
- LOSS MEASUREMENT FOR RUBY LASER RESONANT CAVITY, COMPARING THRESHOLDS FOR R SUB 1 AND R SUB 2 LINE OPERATION A67-16655
- OPTICALLY PUMPED RUBY NOTING ABSORPTION AND EMISSION SPECTRUM, TRANSITION STAGES AND PHONON TERMINATED AMPLIFICATION A67-16658
- OUTPUT SPECTRA OF ND DOPED YAG AND RUBY LASERS, DETERMINING MECHANISMS RESPONSIBLE FOR OBSERVED OVERALL LINEWIDTHS A67-16660
- Q-SWITCHED RUBY LASER CONFIGURATION WITH FEEDBACK CONTROL, NOTING FREQUENCY AND INSTABILITY CORRELATION WITH THEORETICAL RESULTS OBTAINED FROM MATHEMATICAL MODEL A67-16676
- SATURABLE OPTICAL ABSORPTION OF LIGHT FLUX FROM HIGH INTENSITY Q-SWITCHED RUBY LASER A67-16677
- QUENCHING OF ONE PULSED RUBY LASER OSCILLATION BY ANOTHER, NOTING COUPLED RATE EQUATIONS FOR STEADY STATE AND TRANSIENT BEHAVIOR A67-16682
- OPTICAL HETERODYNE TECHNIQUE DETECTING STIMULATED BRILLOUIN SCATTERING, NOTING FREQUENCY SHIFT DEMODULATION ARISING FROM RUBY LASER LIGHT INCIDENCE ON QUARTZ CRYSTAL A67-16688
- HOLOGRAPHIC STUDY OF SECOND HARMONIC WAVE EMITTED BY RUBY LASER, EXAMINING INFLUENCE OF DEFECTS OF SPATIAL COHERENCE OF WAVE A67-17322
- RUBY AND NEODYMIUM GLASS LASERS SUM FREQUENCY GENERATION USING NONLINEAR ELECTRO-OPTICAL KDP CRYSTAL A67-17754
- SEMICONDUCTOR MIRROR FOR Q-FACTOR MODULATION OF LASER RESONATOR A67-18789
- LASER APPLICATION TO METEOROLOGY, DISCUSSING RAYLEIGH, AEROSOL AND RAMAN SCATTERING, SYSTEM CONFIGURATION AND MEASUREMENT PROBLEMS A67-19091
- HIGH ALTITUDE ATMOSPHERIC SCATTERING OF INTENSE LIGHT FROM RUBY LASER BEAM INTERPRETED PRINCIPALLY IN TERMS OF RAYLEIGH SCATTERING FROM ATMOSPHERIC MOLECULES A67-19419
- SUM RADIATION FREQUENCY GENERATION BY RUBY AND NEODYMIUM LASERS IN KDP CRYSTALS A67-19734
- WAVE INTERACTION IN SATURABLE ABSORBERS, NOTING HOLE BURNING IN DYE SWITCHED RUBY LASER A67-20094
- RUBY LASER MODE LOCKING AND MODE COMPETITION USING RG-8 FILTER AS PASSIVE MODULATOR A67-20147
- RUBY LASER INJURY TO EYE OF MONKEYS, MACACA CYNOMOLGUS AND CERCOCEBUS TORQUATUS ATYS A67-80364
- ENERGY-LOSING BLEACHING MECHANISM OF ORGANIC PHOTOTROPIC CRYSTALS USED FOR RUBY LASER SWITCHES ATD-66-119 N67-10437
- GIANT OPTICAL RADIATION PULSES FROM RUBY LASERS BY CONTROL OF STATIC CAVITY GEOMETRY TR-4 N67-10950
- EFFECTS OF RUBY LASER RADIATION ON OCULAR TISSUE OF RABBITS AND ESTIMATION OF HUMAN CORNEAL THRESHOLD FA-R-1815 N67-10968
- TEMPERATURE DEPENDENCE OF FLUORESCENT FREQUENCY SHIFT IN RUBY LASER FTD-TT-65-2006 N67-10978
- INTERFERENCE MEASUREMENT OF HOMOGENEITY OF RUBY RESONATOR FOR LASER FTD-TT-66-44 N67-11161
- HIGH POWER LASER RESEARCH - LASER MATERIAL EVALUATION, STIMULATED OUTPUT AND Q-SWITCHING, SELF-FOCUSING IN LIQUIDS, AND FLASH LAMP SPECTROSCOPY NRL-6444 N67-12645
- MAGNETIC LOW TEMPERATURE Q-SWITCHING OF RUBY LASER N67-12648
- FARADAY EFFECT AS SWITCHING TECHNIQUE FOR HIGH POWER LASER OUTPUT N67-12651
- MEASUREMENT AND THEORY, INCLUDING SIGNAL TO NOISE AND TRANSFER FUNCTION CALCULATIONS, OF ATMOSPHERIC WATER VAPOR USING RUBY LASER OPTICAL RADAR N67-13488
- PRODUCTION ENGINEERING MEASURE FOR RUBY LASER RODS QPR-3 N67-15107
- LOW NOISE RECEIVERS - TRAVELING WAVE MASER DEVELOPMENT N67-15913
- EXTERNAL MIRROR FOR LASER BRIGHTNESS GAIN AND THERMAL COMPENSATING MODE CONTROL

- N67-16954
- JOURNAL OF APPLIED SPECTROSCOPY ARTICLES ON RUBY LASERS AND ACTIVATED ALKALI HALIDE SCINTILLATORS  
FTD-HT-66-310 N67-17169
- RUBY LASER OPERATION WITH INCLINED MIRRORS  
N67-17170
- PROBABILITY METHOD OF DETERMINING ENERGY LOSSES IN RUBY LASER WITH MISALIGNED RESONATORS  
FTD-HT-66-492 N67-19235
- RUTILE**  
ZERO MAGNETIC FIELD MILLIMETER MASER USING TRIVALENT IRON ION IN HOST CRYSTALLINE STRUCTURE OF RUTILE /TITANIUM DIOXIDE/ AS ACTIVE MATERIAL  
A66-29018
- MASER MATERIAL IRON DOPED RUTILE; EXAMINING THEORETICAL AND EXPERIMENTAL DISAGREEMENT IN SPIN HAMILTONIAN DESCRIBING PARAMAGNETIC BEHAVIOR  
A66-29027
- PARAMAGNETIC RESONANCE SPECTRA SHIFT DUE TO TEMPERATURE CHANGE IN CROSS-RELAXATION RUTILE MASER  
A66-30820
- L-BAND TRAVELING WAVE MASER USING CHROMIUM DOPED RUTILE, DISCUSSING INVERTED SUSCEPTIBILITY AS FIGURE OF MERIT  
A66-38239
- CHROMIUM-DOPED RUTILE SUITABILITY AS ACTIVE MATERIAL IN SOLID STATE MASER RESONATOR  
A67-10246
- S**
- S-BAND**  
ULTRALOW-NOISE TUNABLE S-BAND AMPLIFIER USING TWM AS SECOND STAGE  
A67-10106
- SAFETY FACTOR**  
LASER SAFETY STANDARDS, DISCUSSING NATURE OF PHOTOBIOLOGICAL MECHANISMS RESPONSIBLE FOR TISSUE DAMAGE UPON EXPOSURE TO LASER RADIATION  
A66-27775
- SAFETY HAZARD**  
PROTECTION AND HAZARD TO EYES OF UNINFORMED OPERATORS AND BYSTANDERS FROM LASER LIGHT  
A66-27668
- SAFETY PROGRAM FOR LASER HAZARDS, DISCUSSING EYE AND BODY PROTECTION  
A67-19089
- SAGNAC EFFECT**  
SAGNAC EFFECT - INTERFEROMETER OR RING LASER FOR ELECTROMAGNETIC SENSING OF ABSOLUTE ROTATION  
AFCRL-66-311 N66-39733
- SAMARIUM**  
DIVALENCE SAMARIUM ION DOPED CALCIUM FLUORIDE LASER ACTION AT LOW TEMPERATURES OBTAINED WITH GIANT PULSE RUBY LASER EXCITATION  
A67-16661
- SAMARIUM COMPOUND**  
DIRECT-EXCITATION LIQUID LASER MEASURED FOR QUANTUM EFFICIENCY FLUORESCENCE  
AD-628526 N66-24728
- SATELLITE COMMUNICATION**  
LOW TEMPERATURE TECHNIQUES IN SATELLITE COMMUNICATIONS SYSTEMS, NOTING MASER, COOLED PARAMETRIC AMPLIFIER AND TREND TOWARD CLOSED-CYCLE REFRIGERATORS  
A66-26104
- TRAVELING WAVE MASER AS PREAMPLIFIER IN GROUND STATION FOR SATELLITE COMMUNICATION  
A66-40658
- VELOCITY ABERRATION AND ATMOSPHERIC REFRACTION PERTAINING TO LASER SATELLITE COMMUNICATION EXPERIMENTS, OBTAINING EQUATIONS FOR ESTIMATION OF EFFECTS  
A67-12054
- SATELLITE INSTRUMENTATION**  
LASER APPLICATION TO METEOROLOGY, DISCUSSING
- RAYLEIGH, AEROSOL AND RAMAN SCATTERING, SYSTEM CONFIGURATION AND MEASUREMENT PROBLEMS  
A67-19091
- SATELLITE ORBIT**  
TOPOCENTRIC DISTANCE OF GEODETIC SATELLITE GEOS-A MEASURED BY LASER TELEMETRY FROM STATION  
A66-30586
- PULSED RUBY LASER PHOTOELECTRIC RECEIVER EXPERIMENTS DETERMINING SATELLITE ORBITS, SUPPLEMENTING BAKER- NUNN CAMERA NETWORK  
A66-42547
- SATELLITE PHOTOGRAPHY**  
RUBY LASER TO ILLUMINATE EXPLORER XXII SATELLITE WITH ENOUGH INTENSITY TO PHOTOGRAPH CUBE CORNER REFLECTORS LOCATED ON SATELLITE  
AFCRL-65-442 N66-31142
- SATELLITE TRACKING**  
RUBY LASER ENERGY REFLECTED OFF EXPLORER XXII SATELLITE  
A66-27054
- SATELLITE RANGE MEASUREMENTS USING LASER IN CONJUNCTION WITH PHOTOELECTRIC RECEIVER AND BAKER- NUNN CAMERA  
A66-29998
- SATELLITE TRACKING WITH LASER - RANGE EQUATION, DETECTION AT NIGHT AND IN DAYLIGHT, NONCOOPERATIVE SATELLITES, AND COMPARISON OF OF LASER AND RADAR SYSTEMS  
NASA-CR-76902 N66-32684
- RANGE MEASUREMENTS OF GEOS-I AND BE-C SATELLITES WITH RUBY LASER  
NASA-CR-77292 N66-34634
- DENSITY AND TEMPERATURE OF UPPER ATMOSPHERE, SATELLITE TRACKING, GEODETIC APPLICATIONS AND LONG DISTANCE MEASUREMENTS, USING LASER OUTPUT  
A67-17591
- SATURATION**  
THRESHOLD STUDIES OF ION LASER OSCILLATIONS IN SULFUR AND SATURATION AND QUENCHING OF LASER INTENSITY  
A66-26209
- COLLISION BROADENED LINEWIDTH AND SATURATION PARAMETERS FOR 6328 ANGSTROM TRANSITION OF NE IN HE- NE LASER  
A66-31084
- SATURATION INDUCED OPTICAL NONRECIPROCITY IN HE- NE RING LASER PLASMA, ELIMINATING FREQUENCY LOCKING BY USING FARADAY EFFECT  
A66-42552
- I R GA AS LASER AMPLIFIER WITH GAINS AS HIGH AS 2000, OUTPUT POWERS OF 150 MW AND SATURATION OCCURRING WITH CURRENT INCREASE AT LOW LIGHT LEVELS  
A66-42562
- SINGLE MODE OUTPUT POWER MODULATION ANALYSIS OF SATURATION AND GAIN OF GAS LASERS AND EFFECTS OF EXCITATION DENSITY MODULATION AND RESONATOR Q MODULATION  
A67-15111
- SINGLE MODE OUTPUT POWER MODULATION STUDY OF SATURATION AND GAIN OF GAS LASER  
A67-16686
- NONLINEAR MEDIUM ANISOTROPY AND SATURATION EFFECTS ON ORIENTATION OF POLARIZATION ELLIPSE OF GAS LASER MODE  
A67-17823
- SATURN V LAUNCH VEHICLE**  
MANUFACTURING RESEARCH IN SUPPORT OF SATURN V - TIME-TEMPERATURE AS COMMON DENOMINATOR IN WELDING, PINK RUBY LASER FOR DRILLING AND WELDING, AND MAGNETIC-FIELD TOOLS  
NASA-TM-X-53505 N66-36420
- SCANNING**  
MODULATION AND SCANNING OF COHERENT LIGHT FOR APPLICATION TO SIMULATION DISPLAY GENERATION  
AMRL-TR-66-9 N66-39473
- SCANNING DEVICE**  
ELECTRON-BEAM-CONTROLLED CRT SCANLASER

- A66-25557  
ELECTRON BEAM SCANLASER BASED ON LASER CAVITY DIRECTLY AND/OR TRANSVERSELY DEGENERATE HAVING Q-SPOILED FOR ALL MODES BUT ONE A66-38244
- INTERNALLY SCANNED LASER BEAM HAVING HIGH DEFLECTION RATE PRODUCED BY PULSED OPTICAL DELAY LINE A67-16647
- LASER LINE-SCANNING PHOTOGRAPHIC SYSTEM, DISCUSSING POSSIBLE EXTRATERRESTRIAL APPLICATIONS A67-19011
- SCATTERING**  
MODE COUPLING EFFECTS DUE TO SCATTERING IN TRAVELING WAVE HELIUM-NEON RING LASER NASA-CR-82490 N67-19096
- SCATTERING CROSS SECTION**  
ATMOSPHERIC OBSERVATION WITH ADVANCED LIGHT RADAR, NOTING EQUIPMENT CHARACTERISTICS, MOLECULAR SCATTERING MECHANISM, ETC A66-26133
- GROWTH RATE OF IONIZATION BY ELECTRON IMPACT IN PRESENCE OF LASER BEAM, ELASTIC AND INELASTIC SCATTERING CROSS SECTIONS, FREE-FREE ABSORPTION, EXCITATION AND IONIZATION COEFFICIENTS, BREAKDOWN TIMES AND THRESHOLDS A66-26193
- SCATTERING OF LIGHT FROM PULSED RUBY LASER BY PLASMA JET, NOTING CROSS SECTION, ELECTRON-PHONON INTERACTION, ETC A66-30139
- RECORDING OF LIGHT-INDUCED LIGHT SCATTERING USING LASER BEAM, CALCULATING CROSS SECTION OF PHOTON-PHOTON SCATTERING A66-31175
- FABRY-PEROT ETALON USE FOR INTERFEROMETRY AND LASER CONTROL, NOTING LOW ANGLE SCATTERING, LASER OSCILLATION, THERMAL TUNING SENSITIVITY, ETC A66-32619
- SCATTERED LIGHT SPECTRUM IN THETATRON PLASMA, NOTING ONSET OF ION WAVE INSTABILITY A67-10248
- LASER APPLICATION TO METEOROLOGY, DISCUSSING RAYLEIGH, AEROSOL AND RAMAN SCATTERING, SYSTEM CONFIGURATION AND MEASUREMENT PROBLEMS A67-19091
- HIGH ALTITUDE ATMOSPHERIC SCATTERING OF INTENSE LIGHT FROM RUBY LASER BEAM INTERPRETED PRINCIPALLY IN TERMS OF RAYLEIGH SCATTERING FROM ATMOSPHERIC MOLECULES A67-19419
- SCATTERING MATRIX**  
SCATTERING MATRIX ANALYSIS OF SINGLE FREQUENCY MICHELSON TYPE HE-NE GAS LASER, INCLUDING FREQUENCY AND AMPLITUDE STABILITY ANALYSIS OF OSCILLATION SPECTRUM A66-42566
- SCHLIEREN PHOTOGRAPHY**  
OPTICAL SYSTEM FOR SCHLIEREN RECORDING, DEFLECTION MAPPING, SHADOWGRAPHY AND INTERFEROMETRY ACHIEVED FOR LASER LIGHT, USED IN RECORDING OF REFRACTIVE INDEX FIELDS A66-26307
- SCHLIEREN PHOTOGRAPHS OF PLASMA DISCHARGES IN PARALLEL PLATE RAIL TUBE, USING PULSED RUBY LASER AS LIGHT SOURCE A66-41510
- COMPRESSIBLE AND INCOMPRESSIBLE FLOWS MADE VISIBLE BY OPTICAL METHOD SENSITIVE TO DENSITY VARIATIONS, SHADOWGRAPH, SCHLIEREN SYSTEM, MACH-ZEHNDER INTERFEROMETER AND HOLOGRAPHIC INTERFEROMETRY WITH LASERS A66-43196
- LASER LIGHT SOURCE CONTROLLED BY KERR CELL COUPLED WITH Z-TYPE SCHLIEREN OPTICAL SYSTEM TO PRODUCE MULTIPLE FLASH PHOTOGRAPHS OF DETONATION WAVE DEVELOPMENT A67-12227
- LASERS APPLIED TO PHOTO-OPTICAL INSTRUMENTATION PROBLEMS, DETAILING SCHLIEREN SYSTEMS, INTERFEROMETRY, HIGH SPEED STREAK PHOTOGRAPHY AND TRANSISSOMETER A67-12243
- TRANSITION TO DETONATION IN GASEOUS MEDIUM EXPERIMENTALLY STUDIED, BASED ON SELF-SUSTAINED DETONATION FRONT AND ADAPTATION OF AMPLITUDE MODULATED GIANT PULSE LASER SYSTEM A67-13500
- SENSITIVITY OF OPTICAL SYSTEM USED IN SCHLIEREN SETUP IN DETERMINING QUALITY OF RECORDED INFORMATION A67-14606
- GAS LENS FOCUSING OF LIGHT BEAMS, USING HIGHLY TRANSPARENT GAS WITH WEAKLY VARYING REFRACTIVE INDEX TO GUIDE COHERENT TRANSMISSION WITH SMALL LOSSES A67-19789
- SCHROEDINGER EQUATION**  
TIME DEPENDENT SCHROEDINGER EQUATION FOR BLOCH ELECTRON IN PRESENCE OF LASER FIELD, USING WKB APPROXIMATION METHOD, COMPARED WITH PERTURBATION THEORY A66-41266
- STEADY STATE LASER DESIGN, COMPARING BALANCE METHOD WITH METHOD BASED ON QUASI-CLASSICAL THEORY A67-20245
- SCINTILLATOR**  
JOURNAL OF APPLIED SPECTROSCOPY ARTICLES ON RUBY LASERS AND ACTIVATED ALKALI HALIDE SCINTILLATORS FTD-HT-66-310 N67-17169
- SCREEN EFFECT**  
INTERFERENCES BETWEEN WAVES DIFFRACTED BY CIRCULAR SCREENS OR THIN WIRES AND COHERENT BACKGROUND PROVIDED BY LASER, PRODUCING RINGS OR RECTILINEAR FRINGES A67-10231
- SECONDARY HARMONIC GENERATION**  
SECOND HARMONIC GENERATIONS AND MIXINGS OF RAMAN LINES PRODUCED IN CYCLOHEXANE, ACETONE, BENZENE AND CARBON DISULFIDE, PHOTOGRAPHING FIRST ORDER STOKES RADIATION A67-12052
- KINETIC EQUATION DERIVATION FROM DENSITY MATRIX FOR CASE OF QUANTUM GENERATION OF SECONDARY OPTICAL HARMONIC IN LASER CAVITY UNDER VARIOUS OPTICAL PUMPING CONDITIONS A67-13127
- SECOND HARMONIC GENERATION OF LIGHT BY FOCUSED LASER BEAMS IN NONLINEAR CRYSTALS AT EXIT SURFACE A67-16640
- HOLOGRAPHIC STUDY OF SECOND HARMONIC WAVE EMITTED BY RUBY LASER, EXAMINING INFLUENCE OF DEFECTS OF SPATIAL COHERENCE OF WAVE A67-17322
- SELENIUM**  
Q-SWITCHED LASER OPERATION OBSERVED USING LIQUID SELENIUM MIRROR AS REFLECTOR IN RUBY LASER MEASURING REFLECTIVITY CHANGES A67-16679
- LASING POTENTIALS OF COMPOUNDS PREPARED FROM ELEMENTS OF GROUP II AND GROUP IV IN PERIODIC TABLE N67-16953
- SELENIUM COMPOUND**  
TRIVALENT NEODYMIUM IN SELENIUM OXYCHLORIDE, INORGANIC LIQUID LASER WITHOUT LIMITATIONS OF EUROPIUM CHELATES AND MATCHING IN THRESHOLD AND OUTPUT NEODYMIUM-DOPED CRYSTALS A66-39110
- PERFORMANCE CHARACTERISTICS OF ROOM TEMPERATURE LIQUID LASER, USING TRIVALENT ION NEODYMIUM-DOPED SELENIUM OXYCHLORIDE A66-39111
- SELF-CONSISTENT FIELD /SCF/**  
LAMB SELF-CONSISTENT THEORY AND RATE EQUATION APPROXIMATION STUDY OF MAGNETIC DEPOLARIZATION OF VAPOR AND POLARIZATION OF MONOMODE GAS LASER IN MAGNETIC FIELD A67-16644
- SELF-EXCITATION**  
SINGLE MODE APPROXIMATION OF PARAMETRIC EXCITATION AND SELF-EXCITATION OF OSCILLATIONS IN FABRY-PEROT RESONATOR FILLED WITH NONLINEAR DISPERSIVE MEDIUM A67-11575
- SELF-OSCILLATION**  
TIME STRUCTURE AND AMPLITUDE SELF-MODULATION OF

- EMISSION FROM GA AS INJECTION LASER OBSERVED,  
USING ELECTRON-OPTICAL CONVERTER A67-17756
- SEMICONDUCTOR**
- NONLINEAR SUSCEPTIBILITY DESCRIBING SECOND  
HARMONIC GENERATION OF LIGHT MEASURED IN  
SEMICONDUCTORS WITH ZINC-BLENDE SYMMETRY, USING  
QUANTUM MECHANICS AND LASER WAVELENGTH A66-26149
- PHOTOLUMINESCENCE AND STIMULATED EMISSION OF  
GALLIUM ARSENIDE AND INDIUM ANTIMONIDE OBTAINED BY  
OPTICAL PUMPING, NOTING EFFECT OF APPLIED MAGNETIC  
FIELD ON LASER AND DIODE EMISSIONS A66-26182
- FORMATION OF MAGNETIC PINCH IN ELECTRON-HOLE  
PLASMA IN IN SB AND POSSIBILITY OF POPULATION  
INVERSION IN PINCH D1-82-0502 N66-29169
- DOPING OF SEMICONDUCTORS BY ION BOMBARDMENT -  
MACHINING BY LASER BEAM - OSCILLATIONS AND  
CIRCUIT BEHAVIOR OF GUNN DIODES N66-35029
- ACOUSTIC WAVE AMPLIFICATION STUDIES, OPTICAL MASER  
RESEARCH, OSCILLATIONS IN SEMICONDUCTORS, AND  
BULK INSTABILITIES IN FERROMAGNETIC MATERIALS  
ML-1424 N66-37453
- OPTICAL NONLINEARITIES DUE TO CONDUCTION BAND  
ELECTRONS IN IN AS, IN SB, GA AS AND PB TE  
STUDIED, USING Q-SWITCHED CARBON DIOXIDE LASER  
RADIATION A67-12524
- OPTICAL MIXING DUE TO CONDUCTION BAND ELECTRONS IN  
SEMICONDUCTOR A67-12525
- LASER BEAM-INDUCED RECRYSTALLIZATION OF AMORPHOUS  
GE SEMICONDUCTOR THIN FILMS PREPARED BY THERMAL  
DEPOSITION ON GLASS A67-13839
- SEMICONDUCTOR DEVICE**
- COOLER FOR SEMICONDUCTOR LASERS AND PHOTODETECTORS  
USING LOW TEMPERATURE GAS A66-26559
- SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-  
PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION  
A66-27187
- SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-  
PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION  
A66-43085
- SEMICONDUCTOR INJECTION LASERS  
REPT.-8 N66-27687
- ABSTRACTS OF 15 ARTICLES ON ELECTRONICS, MASERS,  
SEMICONDUCTOR DEVICES, AND RADIO AND OTHER  
TRANSMISSION SYSTEMS TAKEN FROM CHINESE PEOPLES  
REPUBLIC OPEN LITERATURE ATD 66-6 N66-28300
- LASER SPECIFICATIONS AND PHOTOELECTRIC  
SEMICONDUCTOR - METEOROLOGICAL COMPUTER FOR  
AIR TRANSPORT FTD-TT-65-1953/164 N66-29797
- CONFERENCE PAPERS ON ELECTRO-OPTICAL DEVICES AND  
TECHNIQUES IN COMMUNICATIONS, INSTRUMENTATION,  
GUIDANCE, AND RADAR AGARD-CP-5 N67-13061
- SEMICONDUCTOR LASER**
- GALLIUM ARSENIDE LASER DIODE CHARACTERISTICS  
A66-25112
- SEMICONDUCTOR BULK INJECTION LASER COMPARED TO  
JUNCTION LASERS, NOTING IN SB NPP STRUCTURES  
A66-25556
- GALLIUM ARSENIDE P-N JUNCTION LASER DIODE,  
INJECTION CURRENT DISTRIBUTION, DENSITY AND  
EMISSION SPECTRA VARIATION A66-25934
- STIMULATED EMISSION FROM ELECTRON BEAM EXCITATION  
OF TELLURIUM AND PURE AND N-TYPE DOPED INDIUM
- ANTIMONIDE IN SEMICONDUCTOR LASERS A66-26179
- Q-SWITCHED LASERS, INTERACTION OF HIGH POWER LIGHT  
PULSE WITH MATTER AND SEMICONDUCTOR LASERS PUMPED  
WITH OPTICAL RADIATION AND ELECTRON BEAMS  
INVESTIGATED, USING QUANTUM OSCILLATOR AND  
AMPLIFIER A66-26180
- EXCITATION IN ELECTRON BEAM PUMPED / EBP/ GA AS  
LASERS INCLUDING ELECTRON SCATTERING, ENERGY  
DISSIPATION PATTERN, PHONON EMISSION, PAIR  
PRODUCTION, ETC A66-26181
- MATHEMATICAL MODEL OF GA AS INJECTION LASER  
APPLIED IN DETERMINING MAXIMUM OBTAINABLE POWER  
OUTPUT, USING RATE EQUATIONS OF ELECTRON AND  
PHOTON DENSITIES AND THERMAL RESISTANCE FOR  
OPTIMUM VALUE A66-26572
- PHOTOMETRIC FIGURES OF MERIT FOR VARIOUS SHAPED  
SEMICONDUCTOR LUMINESCENT SOURCES OPERATING IN  
SPONTANEOUS MODE A66-27495
- SPONTANEOUS EMISSION AND TRANSVERSE GAIN  
MEASUREMENTS IN GA AS INJECTION LASER AT 80  
DEGREES K AND FOR 8466 ANGSTROM WAVELENGTH  
A66-28627
- GALLIUM ARSENIDE LASER DESIGN USING P-N JUNCTION  
OBTAINED BY DIFFUSION OF ZINC IN TELLURIUM DOPED  
N- GA AS SINGLE CRYSTAL A66-29057
- SPONTANEOUS AND COHERENT PHOTOLUMINESCENCE IN  
CADMIUM MERCURY TELLURIDE CRYSTALS EXCITED  
OPTICALLY BY GA AS DIODE LASER A66-29390
- ULTRASHORT OPTICAL PULSES GENERATED BY MODE  
LOCKING CONTINUOUS NEODYMIUM DOPED YTTRIUM-  
ALUMINUM GARNET LASER A66-29391
- RELAXATION TIME FOR RECOMBINATION RADIATION FROM  
SEMICONDUCTOR SOURCE DETERMINED BY MEASURING  
CURRENT/EMISSION PHASE SHIFT A66-29704
- FREQUENCY STABILITY AND SPECTRAL PURITY OF P-N  
JUNCTION LASER OUTPUT IMPROVED BY SYNCHRONIZATION  
WITH GAS LASER BEAM A66-29717
- DISLOCATIONS AND PRECIPITATES IN GA AS INJECTION  
LASERS REVEALED BY NEW A-B ETCHANT A66-31071
- SEMICONDUCTOR LASERS WITH HIGH POWER EFFICIENCY  
OBTAINED VIA ELECTRON BEAM EXCITATION ON CRYSTALS  
OF MIXED CADMIUM-SULFIDE-SELENIDE ALLOY A66-31533
- LASER CAVITY OUTPUT OPTIMIZATION FOR MAXIMUM  
EXTERNAL QUANTUM EFFICIENCY SHOWING DEPENDENCE ON  
LENGTH AND REFLECTIVITY FOR GIVEN CURRENT DENSITY  
A66-31535
- INDIUM ARSENIC ANTIMONIDE SINGLE CRYSTALS IN P-N  
JUNCTION LASER A66-31767
- COHERENT EMISSION OF INDIUM ARSENIDE PHOSPHIDE P-N  
JUNCTION A66-31788
- P-N JUNCTION LASERS FOR SHORT RANGE  
COMMUNICATIONS, EXAMINING DESIGN, TECHNOLOGICAL  
PROBLEMS AND PERFORMANCE A66-31956
- SELECTIVE DIFFUSED JUNCTION LASER, DISCUSSING  
GA AS LASER USED FOR QUENCHING EXPERIMENT  
A66-32408
- PHOTO EMF VARIATION WITH RADIATION POWER OF  
Q-SWITCH RUBY LASER INCIDENT ON SILICON CRYSTAL  
WITH P-N JUNCTION A66-32509
- LARGE WAVELENGTH CHANGES IN GALLIUM ARSENIDE  
INJECTION LASERS DUE TO CHANGES IN CAVITY Q  
A66-32635
- KINETIC THEORY OF SEMICONDUCTOR LASER WITH P-N  
STEP JUNCTION A66-33126

- LINE WIDTH OF SEMICONDUCTOR LASER  
A66-33127
- GENERATION IN CADMIUM SULFIDE DURING TWO-PHOTON  
OPTICAL EXCITATION BY RUBY LASER WITH MODULATED  
Q-FACTOR A66-33134
- SCANNING ELECTRON MICROSCOPE TO EXAMINE CRYSTAL  
MOAIC STRUCTURES AND LASING PROPERTIES OF GALLIUM  
ARSENIDE LASER DIODES A66-33300
- LASER BASED ON EXCITATION OF GALLIUM PHOSPHORUS  
ARSENIDE SOLID SOLUTION BY BEAM OF FAST ELECTRONS  
A66-33304
- OPTICAL MODULATION IN BULK GALLIUM ARSENIDE, USING  
GUNN EFFECT A66-33606
- GALLIUM ARSENIDE DIODE LASER AS PULSED IR SOURCE  
FOR EXPERIMENT AND DESIGN CONSIDERATIONS FOR RADAR  
INDICATION OF CLOUD HEIGHT AND VISIBILITY  
A66-33616
- LIGHT ABSORPTION BY FREE CURRENT CARRIERS ROLE IN  
KINETIC EQUATIONS OF SEMICONDUCTOR  
LASER/RADIATION SYSTEM A66-34691
- ORIENTATION EFFECT IN GA AS INJECTION LASERS,  
NOTING EMISSION CHARACTERISTICS AND STRUCTURAL  
SPECTRA A66-35404
- GALLIUM ARSENIDE LASER EXCITATION BY FAST  
ELECTRONS A66-35760
- FORCED EMISSION FROM ELECTRON-EXCITED CADMIUM  
SELENIDE A66-35788
- VALENCE BAND SPIN-ORBIT SPLITTING IN HIGHLY  
DEGENERATE SEMICONDUCTORS DETERMINED FROM  
SPLITTING OF PEAK LASER DIODE EMISSION IN HIGH  
MAGNETIC FIELDS A66-36036
- GALLIUM ARSENIDE LASERS OPERATING AT ROOM  
TEMPERATURE INVESTIGATED, BASED ON DIFFUSION P-N  
JUNCTIONS, DISCUSSING EMISSION SPECTRUM  
A66-36070
- SEMICONDUCTOR LIGHT EMISSION MECHANISMS EXAMINED  
INCLUDING WAVELENGTH EMITTED, WIDTH OF RAY EMITTED  
AND EFFICIENCY OF EMISSION A66-36263
- REPLACING HEATED TUNGSTEN FILAMENT AND IR FILTER  
BY GA AS ELECTROLUMINESCENT DIODE WITHOUT FILTER  
FOR IR ILLUMINATION A66-36266
- INDIUM ARSENIDE LASERS AND HG TE- CD TE  
PHOTODETECTORS WITH VERY FAST TIME CONSTANTS FOR  
IR SPECTRAL BAND A66-36268
- AVALANCHE TRANSISTOR GENERATION OF JITTER-FREE  
NANOSECOND CURRENT PULSES FOR DRIVING GA AS LASER  
DIODES AT LOW TEMPERATURES A66-37453
- POLARIZATION OF PULSED RADIATION FROM GA AS LASER  
DIODE TO DETERMINE ORIGIN OF NATURAL OSCILLATIONS  
OF RESONATOR A66-37549
- SPECTRAL CHARACTERISTICS OF TWO-PHOTON OPTICAL  
EXCITATION AND LIGHT EMISSION FROM CD SE  
SEMICONDUCTOR LASER WITH MODULATED Q-FACTOR  
A66-37565
- PULSE GENERATOR FOR DRIVING SEMICONDUCTOR LASER  
DIODE, NOTING CIRCUIT DIAGRAM AND OPERATING  
CHARACTERISTICS A66-37588
- EXCITATION OF AXIAL OSCILLATION MODES IN  
SEMICONDUCTOR LASERS ANALYZED, BASED ON RATE  
EQUATIONS FOR CHEMICAL POTENTIALS OF CARRIERS AND  
NUMBER OF PHOTONS A66-37687
- IMPURITY CONCENTRATION EFFECT ON MAXIMUM  
CONTINUOUS WAVE POWER FROM GALLIUM ARSENIDE LASERS  
AT 77 DEGREES K A66-37782
- MIRROR DAMAGE ALLEVIATION IN GIANT PULSE  
SEMICONDUCTOR LASER OPERATION, DISCUSSING USE OF  
HIGH MELTING POINT MIRRORS COOLING AND OBLIQUE  
INCIDENCE A66-38245
- GAIN FACTOR VARIATION WITH THRESHOLD CURRENT IN  
REFLECTIVE AND ANTIREFLECTIVE FILMS OF GA AS  
LASER WITH PHOTON AND CURRENT DENSITIES A66-38388
- OPTICAL COUPLING USING GALLIUM ARSENIDE LASER FOR  
VARIATION OF FREQUENCY OF DIODE EMISSION THROUGH  
SMALL CHANGE IN CURRENT DENSITY A66-38920
- PERFORMANCE OF GA AS SEMICONDUCTOR LASER WITH  
RESONATOR, NOTING DEPENDENCE OF FORBIDDEN ZONE  
WIDTH AND ABSORPTION COEFFICIENT ON FREE CARRIER  
CONCENTRATION AND INCIDENT PHOTON ENERGY A66-38955
- CHARACTERISTICS OF EFFICIENT SEMICONDUCTOR LASERS  
IN UV PORTION OF SPECTRUM OBTAINED AT BOTH LIQUID  
HELIUM AND NITROGEN TEMPERATURES, USING PULSED  
ELECTRON BEAM EXCITATION ON ZN S CRYSTALS A66-39114
- INTENSITY AND FREQUENCY EQUATIONS FOR INTERBAND  
OPTICAL TRANSITIONS AND MULTIMODE PROPERTIES IN  
SEMICONDUCTOR LASERS A66-39666
- FAR-FIELD LIGHT EMISSION MODE PATTERN OF GA AS  
DIODE INJECTION LASERS, DIELECTRIC GRADIENT IN  
INVERSION LAYER AND REFRACTIVE INDEX IN JUNCTION  
A66-39743
- 1.60 MICRON STIMULATED AND SPONTANEOUS EMISSIONS  
FROM EPITAXIAL SINGLE CRYSTALS IN QUASI-BINARY  
III-V COMPOUND SEMICONDUCTOR DIODES OF INJECTION  
LASERS AT 77 DEGREES K A66-39750
- SPONTANEOUS AND STIMULATED EMISSION FROM GA AS  
DIODES WITH THREE-LAYER STRUCTURES CONSISTING OF  
N-N-P, N-I-P OR N-P-P DIODES A66-40102
- ROOM TEMPERATURE PERFORMANCE OF GA AS LASER  
DIODES, USING S C RS TO ACHIEVE HIGH PULSE  
REPETITION RATE A66-40175
- COHERENT RADIATION GENERATION IN ELECTRON-HOLE  
INDIUM ANTIMONIDE PLASMA, DISCUSSING EMISSION  
SPECTRUM A66-40319
- ELECTRON THERMALIZATION EFFECT ON SEMICONDUCTOR  
LASER BEHAVIOR, NOTING OPTICAL TRANSITION BETWEEN  
IMPURITY LEVEL AND BAND, TAKING INTO ACCOUNT  
DIFFUSION PROCESS A66-40790
- NEODYMIUM DOPED GLASS LASER USING SATURABLE LIQUID  
Q-SWITCH A66-41033
- GA AS SEMICONDUCTOR QUANTUM GENERATOR HEATING  
DURING INJECTION PULSE, ANALYZING TEMPERATURE  
EFFECT ON EXTERNAL QUANTUM OUTPUT AND GENERATOR  
EFFICIENCY A66-41621
- TRANSVERSE GAIN AND SPONTANEOUS AND STIMULATED  
EMISSION AT 8466 ANGSTROMS IN GA AS STRUCTURES  
A66-42561
- IR GA AS LASER AMPLIFIER WITH GAINS AS HIGH AS  
2000, OUTPUT POWERS OF 150 MW AND SATURATION  
OCCURRING WITH CURRENT INCREASE AT LOW LIGHT  
LEVELS A66-42562
- SEMICONDUCTOR LASER TECHNOLOGY, OPERATING  
PRINCIPLES, MATERIAL PROPERTIES AND PERFORMANCE,  
WITH EMPHASIS ON GA AS JUNCTION LASERS A66-42802
- COHERENT AND NONCOHERENT SEMICONDUCTOR LASERS FOR  
DEVELOPMENT OF FREQUENCY- AND PULSE-MODULATED  
COMMUNICATIONS SYSTEMS  
ESD-TDR-65-232 N66-25513
- P- N JUNCTION, ELECTROMAGNETIC WAVES OF GALLIUM  
ARSENIDE SEMICONDUCTOR LASER  
FTD-TT-65-891/1&2&4 N66-30510
- SEMICONDUCTOR GALLIUM-ARSENIDE LASER WITH FLAT  
RESONATOR N66-36291
- SYNTHESIS, JUNCTION FABRICATION, AND LUMINESCENT  
OPERATION OF GALLIUM-ARSENIDE-PHOSPHIDE

SEMICONDUCTORS  
AFCRL-66-245 N66-36868

SEMICONDUCTOR LASER ARRAY STRUCTURE WITH COMMON  
N-TYPE SUBSTRATE AND INDIVIDUAL CONTACTS TO  
P-LAYER FOR HIGHER OPTICAL POWER OUTPUT A67-10023

INDIUM PHOSPHIDE BASED SEMICONDUCTOR LASER  
AMPLIFICATION, LOSS FACTOR AND RADIATION PATTERN A67-10065

THRESHOLD AND POWER CHARACTERISTICS OF GALLIUM  
ARSENIDE DIODE LASER OPERATING IN PULSED REGIME A67-10066

SURFACE EFFECT ON TEMPERATURE, I-V AND WATT-  
AMPERE CHARACTERISTICS OF P-N JUNCTION  
SEMICONDUCTOR INJECTION LASER DIODE AS COHERENT  
LIGHT SOURCE A67-10077

VOLT-AMPERE CHARACTERISTICS AND OTHER PROPERTIES  
OF GA AS LASERS WITH TELLURIUM AND ZN-DOPED  
EPITAXIAL P-N JUNCTION A67-10080

CURRENT INJECTION EFFECT ON TIME DELAY OF GA AS  
LASER RADIATION A67-10083

MINIMUM SPECTRAL LINE WIDTH, THRESHOLD CURRENT  
DENSITY, RADIATION-PEAK DISPLACEMENT AND POSSIBLE  
RECOMBINATION MECHANISM FOR GA SB LASER DIODE P-N  
JUNCTIONS IN COHERENT RADIATION A67-10085

INDIUM ARSENIC ANTIMONIDE SINGLE CRYSTALS IN P-N  
JUNCTION LASER A67-10087

COHERENT EMISSION OF INDIUM ARSENIDE PHOSPHIDE P-N  
JUNCTION A67-10101

TIME VARIATION IN INTENSITY OF LIGHT EMITTED FROM  
CW GA AS LASER DIODES A67-10243

FLASHLIGHT /INCOHERENT/ PUMPING OF VISIBLE AND  
IR, IN SB AND CD S- CD SE LASERS A67-10447

CONTINUOUS COHERENT RADIATION OF GA AS  
SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT  
AMBIENT TEMPERATURE OF 77 DEGREES K A67-10548

OPTICAL PUMPING WITH DIODE LASER INTO FABRY-  
PEROT RESONATOR FACE OF THIN HIGHLY-ABSORBING  
SEMICONDUCTOR, NOTING VARIABLE MODE SPACING  
INCLUDING SINGLE MODE OUTPUT A67-10879

CONTINUOUS COHERENT RADIATION OF GA AS  
SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT  
AMBIENT TEMPERATURE OF 77 DEGREES K A67-11056

SIMULTANEOUS DERIVATION OF OPTICAL GAIN FACTOR AND  
LOSS PER UNIT LENGTH OF SERIES OF SOLUTION GROWN  
DIFFUSED GA AS INJECTION LASER A67-11072

LASER BASED ON EXCITATION OF GALLIUM PHOSPHORUS  
ARSENIDE SOLID SOLUTION BY BEAM OF FAST ELECTRONS A67-11824

LASER TYPE REGIME OF SEMICONDUCTOR HAVING  
RADIATION INDUCED BY IMPURITY BAND TRANSITIONS OF  
CURRENT CARRIERS A67-13137

THRESHOLD CURRENT DENSITY DEPENDENCY ON PHOTON  
ENERGY IN GALLIUM ARSENIDE LASER DIODES A67-13480

LIGHT ABSORPTION BY FREE CURRENT CARRIERS ROLE IN  
KINETIC EQUATIONS OF SEMICONDUCTOR LASER/RADIATION  
SYSTEM A67-14376

I- V CHARACTERISTIC OF GA AS DIODE WITH FABRY-  
PEROT RESONATOR, NOTING VARIATIONS DURING  
AMPLIFICATION TO GENERATION TRANSITION A67-15132

SPECTRAL CHARACTERISTICS OF TWO-PHOTON OPTICAL

EXCITATION AND LIGHT EMISSION FROM CD SE  
SEMICONDUCTOR LASER WITH MODULATED Q-FACTOR A67-15299

SURFACE ASPECTS OF THERMAL DEGRADATION OF GA AS  
P-N JUNCTION LASERS AND TUNNEL DIODES A67-15620

PERFORMANCE OF GA AS SEMICONDUCTOR LASER WITH  
RESONATOR, NOTING DEPENDENCE OF FORBIDDEN ZONE  
WIDTH AND ABSORPTION COEFFICIENT ON FREE CARRIER  
CONCENTRATION AND INCIDENT PHOTON ENERGY A67-15759

OPTICAL COUPLING USING GALLIUM ARSENIDE LASER FOR  
VARIATION OF FREQUENCY OF DIODE EMISSION THROUGH  
SMALL CHANGE IN CURRENT DENSITY A67-16390

SEMICONDUCTOR LASERS AND FAST IR DETECTORS,  
DISCUSSING IN AS, IN SB AND THREE TYPES OF  
MERCURY CADMIUM TELLURIDE DETECTORS A67-16668

SEMICONDUCTOR LASERS WITH RADIATING MIRRORS  
DEVELOPED BY EXCITATION, USING ELECTRON BEAM AND  
NEODYMIUM LASER GLASS RADIATION A67-16669

FREQUENCY MODULATION OF GA AS SEMICONDUCTOR LASER  
BY ULTRASONIC WAVE MODULATION OF DIELECTRIC  
CONSTANT A67-16671

SEMICONDUCTOR LASERS NOTING STRONG FIELD BEHAVIOR  
AND ABSORPTION COEFFICIENT FOR SATURATION A67-16672

HIGH MAGNETIC FIELD EFFECT ON INTERBAND  
SEMICONDUCTOR LASER, PARTICULARLY ELECTROMAGNETIC  
MODES AND COUPLING AND THRESHOLD CURRENT  
CONDITIONS A67-16673

INDIUM ARSENIDE DIODE LASER FABRICATION USING  
LIQUID PHASE EPITAXY, NOTING QUANTUM EFFICIENCY A67-17096

CHANGE IN BASIC BARRIER RELATION FOR  
HETEROJUNCTION COMPARED TO HOMOJUNCTION OF WIDE  
GAP EMITTER INJECTION LASER A67-17097

SHALLOW DONOR INTRODUCTION IN P-TYPE GA- AS LASER  
RESULTS IN INCREASED EFFICIENCY OF RADIATIVE  
RECOMBINATION A67-17280

TIME STRUCTURE AND AMPLITUDE SELF-MODULATION OF  
EMISSION FROM GA AS INJECTION LASER OBSERVED,  
USING ELECTRON-OPTICAL CONVERTER A67-17756

ELECTROLUMINESCENCE, DISCUSSING SEMICONDUCTOR  
LASERS WITH VARIOUS EXCITATION SOURCES,  
LUMINESCENT EFFICIENCY, ETC A67-17889

RADIO ELECTRONICS, DISCUSSING QUANTUM ELECTRONICS,  
LASERS, MICROWAVE DEVICES AND TECHNOLOGY, PLASMA  
PHYSICS, ETC A67-18072

TEMPERATURE DEPENDENCE OF THRESHOLD CURRENT IN  
INJECTION LASERS IN CONTINUOUS OPERATION UNDER  
LIQUID NITROGEN COOLING A67-18788

SEMICONDUCTOR MIRROR FOR Q-FACTOR MODULATION OF  
LASER RESONATOR A67-18789

INTERBAND ELECTRON ABSORPTION AND DISPERSION  
DURING ONE- AND TWO-PHOTON PROCESSES IN  
SEMICONDUCTORS SUBJECTED TO ELECTROMAGNETIC FIELD,  
NOTING LASER APPLICATIONS A67-18798

SEMICONDUCTOR LASERS USING SINGLE AND DOUBLE  
PHOTON OPTICAL EXCITATION A67-18930

LASERS AND RCA A67-19080

GA AS ROOM TEMPERATURE LASER DIODE APPLICATION TO  
COMMUNICATION AND RADAR SYSTEMS A67-19086

GALLIUM ARSENIDE LASER OUTPUT INCREASE DUE TO

- ALUMINUM EVAPORATED COATING ON SILICON DIOXIDE  
USED AS REFLECTIVE COATING A67-19794
- RESONANCE-LIKE CHARACTERISTICS OF DIRECT  
MODULATION OF JUNCTION LASER WITH BIAS CURRENT  
ANALYZED BY RATE EQUATIONS A67-19800
- SPECTRAL ANALYSIS OF EMISSION OF SPATIALLY  
SEPARATED SPOTS IN GA AS INJECTION LASERS A67-20185
- SEMICONDUCTOR LASERS FOR DIGITAL COMPUTER CIRCUITS  
N67-13063
- OPTICAL PULSE AMPLIFIERS WITH ACTIVE SATURABLE  
ABSORPTION SWITCHES N67-13064
- JUNCTION EFFECTS IN COMPOUND SEMICONDUCTORS  
AFCRL-66-617 N67-15074
- SENARMONT POLARISCOPE**  
SENARMONT POLARISCOPE APPLIED TO ANALYSIS OF  
OPTICAL MASER LIGHT N67-17278
- SENSING**  
METEOROLOGICAL VARIABLE SENSING BY LASER PROBES  
NASA-CR-77909 N66-36261
- SENSOR**  
RING LASER ROTATION RATE SENSOR NOTING RELATION TO  
ELECTROMAGNETIC RADIATION A66-42564
- RING LASER INERTIAL SENSOR FOR AEROSPACE SYSTEMS  
OBTAINING HIGH ACCURACY ANGULAR RESOLUTION AND  
MECHANICAL SIMPLICITY A67-15665
- SERVOMECHANISM**  
DIGITAL-MODE FM CW LASER RANGING AND TRACKING  
SYSTEM USING COMPOUND AXIS SERVOMECHANISM A66-25982
- SHADOW PHOTOGRAPHY**  
SHAPE AND DIMENSION OF SPARK ARISING DURING  
FOCUSING OF LASER EMISSION A66-29210
- SHAPE AND DIMENSION OF SPARK ARISING DURING  
FOCUSING OF LASER EMISSION A66-33059
- LASER LIGHT SOURCE CONTROLLED BY KERR CELL  
COUPLED WITH Z-TYPE SCHLIEREN OPTICAL SYSTEM TO  
PRODUCE MULTIPLE FLASH PHOTOGRAPHS OF DETONATION  
WAVE DEVELOPMENT A67-12227
- SHADOWGRAPH**  
COMPRESSIBLE AND INCOMPRESSIBLE FLOWS MADE VISIBLE  
BY OPTICAL METHOD SENSITIVE TO DENSITY VARIATIONS,  
SHADOWGRAPH, SCHLIEREN SYSTEM, MACH-ZEHNDER  
INTERFEROMETER AND HOLOGRAPHIC INTERFEROMETRY WITH  
LASERS A66-43196
- SHOCK TUNNEL**  
HIGH TEMPERATURE FLOW CHARACTERISTICS IN FREE  
PISTON SHOCK TUBE MEASURED BY MEANS OF PULSED  
LIGHT OF HE-NE GAS LASER A66-35353
- LIGHT REFLECTION FROM SHOCK WAVES CLARIFIED  
THROUGH PROPAGATION IN SHOCK TUBES, USING GAS  
LASER A66-40012
- TWYMAN-GREEN ARRANGEMENT OF INTERFEROMETER WITH  
NARROW LASER BEAM AND TWIN PHOTOMULTIPLIERS,  
EXAMINING STRONG SHOCKS IN ARGON IN 15.2 CM SHOCK  
TUBE A67-12688
- SHOCK WAVE**  
THERMALIZATION OF PLASMA BY CREATING IMPLoding  
SHOCK WAVE DRIVEN BY LASER ENERGY RELEASE A66-26683
- FAST OVERLAP OF MICROWAVE RADIATION BY IONIZATION  
AUREOLE OF SPARK IN LASER BEAM A66-36719
- LASER PHASOGRAPHY OF JETS, SHOCK WAVES, AND  
PLASMAS  
AFCRL-66-299 N66-33273
- SHOCK WAVE PROPAGATION**  
LIGHT REFLECTION FROM SHOCK WAVES CLARIFIED  
THROUGH PROPAGATION IN SHOCK TUBES, USING GAS
- LASER** A66-40012
- SHUTTER**  
DYNAMICS OF FIELD AND GENERATION FREQUENCIES IN  
GIANT PULSE OF RUBY LASER WITH PASSIVE SHUTTER,  
USING SOLUTION OF CRYPTOCYANINE IN ETHANOL, NOTING  
MIRROR REFLECTION COEFFICIENT A66-29727
- SIDEBAND**  
FIRST- AND SECOND-ORDER SIDEBANDS DUE TO STRONG  
CW SIGNAL INTERMODULATION EFFECT IN 3.39 MU HE-  
NE LASER A66-33615
- SIGNAL ANALYSIS**  
LASER SYSTEM FOR METEOROLOGICAL DATA USING  
OSCILLOSCOPE TO DISPLAY RETURN SIGNAL, TRANSLATED  
AS CONCENTRATIONS OF MATTER OR AEROSOLS A66-43044
- FREQUENCY FLUCTUATIONS OF LASER FIELD  
DETERMINED BY MEASURING CROSS CORRELATION  
FUNCTION AT TWO POINTS A67-16625
- SIGNAL ANALYZER**  
FIRST- AND SECOND-ORDER SIDEBANDS DUE TO STRONG  
CW SIGNAL INTERMODULATION EFFECT IN 3.39 MU HE-  
NE LASER A66-33615
- SIGNAL FADING**  
SPATIAL SELECTIVE FADING AS RANDOM PROCESS,  
DISCUSSING SPATIAL COHERENCE, WAVE NUMBER  
DISPERSION PROFILE, TIME DELAY PROFILE, ETC, IN  
IONOSPHERIC PROPAGATION A66-26859
- SIGNAL GENERATOR**  
THRESHOLD OF PARAMETRIC OSCILLATOR SYSTEM WITH  
IDLER MODES IN SAME FREQUENCY SPACING AS LASER  
PUMP SOURCE A67-16823
- SIGNAL MEASUREMENT**  
MEASURING DEVICE FOR PULSED LASER OUTPUT POWER  
USING BOLTOMETER, AMPLIFIER AND OSCILLOSCOPE  
A66-29701
- SIGNAL MIXING**  
SUM AND DIFFERENCE FREQUENCY MIXING OF VISIBLE AND  
IR GAS LASER LIGHT IN GA P AT NEAR RESTSTRAHL  
FREQUENCIES AND RELATIONSHIP TO SPONTANEOUS RAMAN  
SCATTERING A67-15464
- SIGNAL NOISE**  
GAS-DISCHARGE CW LASERS, PARTICULARLY HE-NE,  
CARBON DIOXIDE, ARGON-ION AND PULSED SELF-  
TERMINATING LASERS, DISCUSSING CLASSIFICATION,  
POWER OUTPUT AND GAIN, DOPPLER WIDTH, COHERENCE  
AND NOISE A66-42801
- SIGNAL PROCESSING**  
CURRENT TRANSDUCER FOR MEASURING CURRENT PULSES IN  
KILOAMPERE RANGE AND SUITABLE FOR LASER RESEARCH  
APPLICATIONS A66-42820
- STATISTICAL DISTRIBUTION OF AM LASER SIGNAL  
ENVELOPE UPON PASSAGE THROUGH TURBULENT ATMOSPHERE  
A67-13988
- LASER APPLICATION TO RADAR SIGNAL PROCESSING AND  
COMMUNICATIONS EQUIPMENT A67-15303
- COHERENT OPTICAL SIGNAL PROCESSORS  
N67-13073
- SIGNAL RECEPTION**  
RADIO LOCATION BY COHERENT LIGHT WITH QUANTUM  
STRUCTURE A67-13283
- SIGNAL TO NOISE RATIO**  
COHERENT LASER LIGHT USE IN ATMOSPHERIC  
COMMUNICATIONS SYSTEM, DISCUSSING EFFECT OF  
ATMOSPHERIC TURBULENCE AND SMALL VIBRATIONS ON  
COHERENT DETECTION EFFICIENCY AND SNR A66-36930
- FREQUENCY FLUCTUATIONS OF LASER FIELD  
DETERMINED BY MEASURING CROSS CORRELATION  
FUNCTION AT TWO POINTS A67-16625
- MEASUREMENT AND THEORY, INCLUDING SIGNAL TO NOISE  
AND TRANSFER FUNCTION CALCULATIONS, OF



- ATMOSPHERIC WATER VAPOR USING RUBY LASER OPTICAL  
RADAR N67-13488
- SIGNAL TRANSMISSION**  
MULTIPLE SCATTERING EFFECTS ON PROPAGATION OF  
COHERENT OPTICAL SIGNALS STUDIED FOR LASER  
COMMUNICATIONS APPLICATION A66-28580
- MEASUREMENTS OF MASER BEAM PROPAGATED THROUGH  
ATMOSPHERE, EMPHASIZING BEAM BROADENING AND SIGNAL  
FLUCTUATION DUE TO CLEAR AIR TURBULENCE A66-28581
- SILICA GLASS**  
PULSED-MODE GAIN CHARACTERISTICS IN NEODYMIUM-  
DOPED SILICATE GLASS LASER EXPERIMENTALLY RELATED  
TO GIANT-PULSE LASER ENERGY OUTPUT A66-38396
- SILICON**  
PHOTO EMF VARIATION WITH RADIATION POWER OF  
Q-SWITCH RUBY LASER INCIDENT ON SILICON CRYSTAL  
WITH P-N JUNCTION A66-32509
- MODULATION BY ULTRASONIC DIFFRACTION OF 10.6  
MICRON LASER RADIATION IN PHOTOELASTIC CD S,  
GA AS AND SI CRYSTALS A66-39112
- SILICON CARBIDE**  
LASER WITH NONRESONANT FEEDBACK - GROWTH OF  
SILICON CARBIDE SINGLE CRYSTALS - SCIENCE NOTES  
N66-28923
- SILICON CONTROL RECTIFIER /SCR/**  
ROOM TEMPERATURE PERFORMANCE OF GA AS LASER  
DIODES, USING S C RS TO ACHIEVE HIGH PULSE  
REPETITION RATE A66-40175
- SILICON OXIDE**  
GALLIUM ARSENIDE LASER OUTPUT INCREASE DUE TO  
ALUMINUM EVAPORATED COATING ON SILICON DIOXIDE  
USED AS REFLECTIVE COATING A67-19794
- SILICON RADIATION DETECTOR**  
OPTO-ELECTRONIC AIRCRAFT ALTIMETER CONCEPT BASED  
ON PROPERTIES OF ELECTRON INJECTION LASERS AND  
SILICON PHOTODIODES N67-13079
- SILVER**  
HIGH POWER LASER BEAM POLARIZATION DIRECTION  
EFFECTS ON ELECTRON EMISSION FROM AG SURFACE  
A67-18759
- SIMULATION**  
TRANSMIT BEAM OFFSET AND COARSE ACQUISITION  
SUBSYSTEMS FOR LASER/OPTICS TECHNIQUE BREADBOARD  
AND ACQUISITION AND TRACK SIMULATION  
NASA-CR-81701 N67-18023
- SIMULATOR**  
AIRBORNE LASER DRIVEN WEAPON SIMULATOR  
NAVTRADEVEN-1867-1 N66-35051
- SINGLE CRYSTAL**  
GALLIUM ARSENIDE LASER DESIGN USING P-N JUNCTION  
OBTAINED BY DIFFUSION OF ZINC IN TELLURIUM DOPED  
N- GA AS SINGLE CRYSTAL A66-29057
- GROWTH OF SINGLE CRYSTALS OF RARE-EARTH FLUORIDES  
FOR LASER APPLICATION, USING HYDROGEN FLUORIDE  
ATMOSPHERE, NOTING ION EXCHANGE PURIFICATION  
A66-31082
- INDIUM ARSENIC ANTIMONIDE SINGLE CRYSTALS IN P-N  
JUNCTION LASER A66-31767
- MEASUREMENTS ON PHYSICAL AND LASER PROPERTIES OF  
VAPOR-GROWN RUBY SINGLE CRYSTALS PREPARED BY  
EPITAXIAL GROWTH A66-36081
- PHOTOCONDUCTIVE AND LUMINESCENT BEHAVIOR OF  
UNDOPED CADMIUM SULFIDE SINGLE CRYSTALS AT ROOM  
TEMPERATURE UNDER LASER EXCITATION A66-39165
- 1.60 MICRON STIMULATED AND SPONTANEOUS EMISSIONS  
FROM EPITAXIAL SINGLE CRYSTALS IN QUASI-BINARY  
III-V COMPOUND SEMICONDUCTOR DIODES OF INJECTION  
LASERS AT 77 DEGREES K A66-39750
- LASER WITH NONRESONANT FEEDBACK - GROWTH OF  
SILICON CARBIDE SINGLE CRYSTALS - SCIENCE NOTES  
N66-28923
- LASER INDUCED PHOTOCONDUCTIVITY IN CADMIUM SULFIDE  
SINGLE CRYSTALS  
REPT.-661 N66-37870
- INDIUM ARSENIC ANTIMONIDE SINGLE CRYSTALS IN P-N  
JUNCTION LASER A67-10087
- SKY RADIATION**  
LASER SYSTEM FOR DETERMINING SKY BACKSCATTERING  
RADIATION - SUBSYSTEM CIRCUIT DIAGRAMS  
NASA-CR-80441 N67-13120
- SODIUM CHLORIDE**  
SELF-FOCUSING OF RUBY LASER BEAM IN NA CL  
CRYSTALS A67-12481
- SOLAR COLLECTOR**  
SUN PUMPED CONTINUOUS WAVE ONE-WATT YAG CRYSTAL  
LASER, NOTING EQUIPMENT SETUP AND OUTPUT DURATION  
A66-32620
- SOLAR ENERGY**  
SOLAR PUMPING AND MODULATION OF VARIOUS LASER  
MATERIALS FOR DEEP SPACE COMMUNICATION, NOTING TV  
PICTURE TRANSMISSION A66-28971
- SOLAR NOISE**  
SOLAR NOISE IN OPTICAL COMMUNICATIONS, BACKGROUND  
RADIATION DEPENDENCE ON DETECTOR APERTURE, NOISE  
POWER AND APPLICATION TO GA AS DIODES AND GAS  
LASERS A66-25833
- SOLAR RADIO BURST**  
LASER CHARACTERISTICS OF NARROW BAND TYPE I SOLAR  
RADIO BURST AND MAGNETIC DIPOLE TRANSITIONS IN  
SPLIT ZEEMAN SUBLEVELS OF HYDROGEN ATOMS OF  
SOLAR CORONA IN GROUND LEVEL A67-11652
- SOLID SOLUTION**  
LASER BASED ON EXCITATION OF GALLIUM PHOSPHORUS  
ARSENIDE SOLID SOLUTION BY BEAM OF FAST ELECTRONS  
A66-33304
- LASER BASED ON EXCITATION OF GALLIUM PHOSPHORUS  
ARSENIDE SOLID SOLUTION BY BEAM OF FAST ELECTRONS  
A67-11824
- SOLID STATE DEVICE**  
MULTICOLOR LASER DISPLAY, DISCUSSING COMPONENTS  
AND FUTURE APPLICATION A66-35532
- SOLID STATE DEVICE, LASER, MATERIALS, AND PHYSICS  
RESEARCH PROJECTS  
ESD-TDR-65-553 N66-23942
- DIFFUSELY TRANSMITTING INTEGRATING SPHERE WITH  
SOLID STATE PHOTODIODE USED IN LASER OUTPUT  
MEASUREMENT A67-10445
- TEMPERATURE DEPENDENCE OF PARAMAGNETIC RESONANCE  
SPECTRAL SHIFTS IN CHROMIUM-DOPED TITANIUM OXIDE  
CRYSTAL OF CROSS RELAXATION RUTILE MASER  
A67-19676
- THEORY AND EXPERIMENTS IN MICROWAVE PROPAGATION  
AND AMPLIFICATION USING SOLID STATE DEVICES, AND  
CALCULATIONS OF ELECTRONIC DEFLECTION OF LASER  
BEAMS  
NASA-CR-80727 N67-13665
- LOW NOISE AMPLIFIERS, LASER RADAR OPTICS, GAS  
LASERS AND HOLOGRAPHY, AND MICROMINIATURIZED  
SOLID STATE DEVICES FOR RADIO ELECTRONICS  
N67-16009
- SOLID STATE LASER**  
IN AS LASER EMISSION, DISCUSSING RADIATIVE  
TRANSITIONS, COHERENT EMISSION FROM IN AS DIODES,  
RECOMBINATION MECHANISMS IN IR RADIATION SPECTRA,  
ETC A66-25065
- NEODYMIUM DOPED YAG CRYSTAL AND LITHIUM META  
NIOBATE AS CW LASER MATERIALS AND POTASSIUM  
TANTALUM NIOBATE AS OPTICAL MODULATOR MATERIAL  
A66-25518

- AUTOMODULATION OF EMISSION FROM SOLID STATE LASER  
A66-26041
- NONLINEAR QUANTUM EFFECT IN SOLID STATE LASERS  
USING PARAMAGNETIC CRYSTALS, NOTING RAMAN EFFECT  
AND GAIN DEPENDENCE ON PUMPING POWER  
A66-26172
- NONEQUILIBRIUM POPULATION BUILDUP AND DETECTION  
FOR IR SOLID STATE LASERS AND I R-OPTICAL  
DOUBLE RESONANCE IN LANTHANUM CHLORIDE CRYSTAL  
A66-26177
- SUPERRADIANCE IN N-TYPE GALLIUM ARSENIDE AT ROOM  
TEMPERATURE EXCITED BY ELECTRON BEAM  
A66-27028
- FAST-ACTING FLUID SEAL FOR Q-FACTOR MODULATION OF  
NEODYMIUM GLASS LASER  
A66-27595
- CAUSES OF FAILURE AND GUIDELINES FOR DESIGN OF  
SOLID STATE LASERS  
A66-27669
- RECENT DEVELOPMENTS IN LASER GENERATION AND  
APPLICATION  
A66-28037
- EXPERIMENTAL OBSERVATION OF REGULAR SPIKING IN  
NEODYMIUM DOPED GLASS LASER ROD ATTRIBUTED TO  
SIMULTANEOUS OSCILLATION OF MANY TRANSVERSE AND  
LONGITUDINAL MODES  
A66-28727
- ZERO MAGNETIC FIELD MILLIMETER MASER USING  
TRIVALENT IRON ION IN HOST CRYSTALLINE STRUCTURE  
OF RUTILE /TITANIUM DIOXIDE/ AS ACTIVE MATERIAL  
A66-29018
- GALLIUM ARSENIDE LASER DESIGN USING P-N JUNCTION  
OBTAINED BY DIFFUSION OF ZINC IN TELLURIUM DOPED  
N- GA AS SINGLE CRYSTAL  
A66-29057
- SEMICLASSICAL THEORY OF QUANTUM GENERATORS,  
EXAMINING LASER SYSTEM RESPONSE TO EFFECT OF  
MONOCHROMATIC STANDING WAVE BASED ON KINETIC  
EQUATION FOR DENSITY MATRIX  
A66-30865
- NONUNIFORM PUMPING EFFECTS ON NEAR-AXIAL LOW-ORDER  
TRANSVERSE MODE STRUCTURE IN SOLID STATE LASER  
CAVITY  
A66-31087
- COHERENT OPTICAL TRANSDUCER FOR OPTICAL  
INFORMATION PROCESSING  
A66-31244
- HIGH POWER CONTINUOUS WAVE FOUR-LEVEL SOLID  
NEODYMIUM GLASS LASER SHOWING LENGTH AND HOST LOSS  
AS DOMINANT FACTORS IN LIMITING OUTPUT POWER  
A66-33334
- SOLID STATE CW OPTICALLY PUMPED MICROWAVE MASER,  
USING DIVALENT THULIUM DOPED CALCIUM FLUORIDE  
A66-33614
- MODE CHARACTERISTICS OF SOLID STATE LASERS FROM  
ANALYTICAL SOLUTION OF CONSERVATIVE EQUATION  
A66-33839
- ENERGY AND POWER OF Q-SWITCHED NEODYMIUM GLASS  
LASER MEASURED, USING CALORIMETRIC DEVICES,  
VACUUM PHOTODIODES, ETC  
A66-34904
- DERIVATION OF TWO EQUATIONS FOR ELECTROMAGNETIC  
FIELD AND POPULATION INVERSION IN SOLID STATE  
LASER  
A66-35370
- LASER OUTPUT ENERGY CONTROLLER HAVING EIGHT-TO-ONE  
IMPROVEMENT IN PULSE REPEATABILITY IN SOLID STATE  
LASERS  
A66-36034
- SOLID STATE LASER APPLICATION TO FUSION WELDING  
A66-40274
- RADIATION NOISE EFFECT ON LASER OPTICAL  
PROPERTIES, NOTING DENSITY VS RESONATOR  
CHARACTERISTICS, ENERGY SPECTRUM, ETC  
A66-40917
- COMPACT DISCHARGE LAMP DESIGNED FOR CONTINUOUS  
PUMPING OF SOLID STATE LASER, WITH INTEGRAL MOUNTS  
FOR CRYSTALS AND ENCLOSURE PROVIDING COOLING  
CIRCUITS FOR LAMP AND CRYSTAL  
A66-41247
- THEORY OF STEADY MULTIMODE OSCILLATION OF SOLID  
STATE LASER EXTENDED TO CAVITIES WITH INEFFICIENT  
END MIRRORS OR LOSSES DEPENDENT ON FREQUENCY  
A66-41274
- SPECTRAL WIDTH OF PEAK TYPE AND MONOPULSE TYPE  
RADIATION OF SOLID-BODY LASER IN NONSTATIONARY  
REGIME  
A66-42133
- BOOK ON LASERS COVERING OPTICAL CAVITIES, GAS  
LASERS, SOLID STATE LASERS, OPTICAL PUMPING,  
Q-SWITCHING, POPULATION INVERSION, ETC  
A66-42319
- MOLECULAR OSCILLATION DIFFERENCE FREQUENCY  
GENERATION IN IR SPECTRUM BY BEATING TOGETHER  
LASER AND LASER-STIMULATED RAMAN EMISSION  
A66-42544
- SOLID STATE MASER OSCILLATOR OPERATING IN ZERO  
FIELD CONFIGURATION, USING FERRIC ION SUBSTITUTED  
AS IMPURITY IN ALUMINUM NITRATE HOST CRYSTAL  
A66-42551
- FAST-ACTING FLUID SEAL FOR Q-FACTOR MODULATION OF  
NEODYMIUM GLASS LASER  
A66-42729
- RADIATION OF GIANT PULSES OF SUPERLUMINESCENCE BY  
HIGHLY EXCITED ACTIVE MEDIUM OF ND GLASS WITH  
RAPID CUT-IN OF AMPLIFICATION  
A66-42755
- CRYSTALLINE SOLID LASERS, CONSIDERING RARE EARTH  
AND TRANSITION METAL IMPURITIES AND HOST  
MATERIALS, NOTING CW LASER CHARACTERISTICS  
A66-42799
- THERMALLY INDUCED EFFECTS ON RUBY AND NEODYMIUM  
IN GLASS LASER RODS  
AFCL-66-57  
N66-26341
- SOLID STATE AND GAS LASER DEVELOPMENT - MANGANESE  
AND RARE EARTH COLLISION LASERS, LASER PUMPING  
LASER, PHOTODISSOCIATION LASERS, AND THERMAL  
OPTICAL EFFECTS IN SOLID STATE LASER MEDIA  
TRG-034-TR-1  
N66-28553
- FABRICATION OF GALLIUM ARSENIDE LASER DIODES BY  
DIFFUSION  
AD-478538  
N66-28726
- SPECTRAL AND MODE PROPERTIES OF RUBY, SOLID STATE,  
FABRY-PEROT, AND NEODYMIUM-DOPED YAG LASERS  
S-852  
N66-30264
- P-N JUNCTION, ELECTROMAGNETIC WAVES OF GALLIUM  
ARSENIDE SEMICONDUCTOR LASER  
FTD-TT-65-891/16264  
N66-30510
- MULTIMODE OSCILLATIONS OF SOLID STATE LASER UNDER  
STATIONARY CONDITIONS EXTENDED TO TREAT CAVITIES  
WITH LOSSY END MIRRORS OR WITH FREQUENCY  
DEPENDENT LOSSES  
AFCL-66-384  
N66-33524
- LASER TECHNOLOGY - MATERIALS, CONTRL, FUNCTIONS,  
DEMULATION, AND PRACTICAL APPLICATIONS  
NASA-TT-F-10201  
N66-33688
- GENERATING MODE NUMBER IN SOLID STATE LASERS USING  
TRAVELING WAVE AND STANDING WAVE  
A67-10069
- INTENSE PULSE GENERATION AT 5300 ANGSTROMS BY  
FREQUENCY DOUBLING IN Q-SWITCHED AND GLASS LASER  
AND POSSIBILITY OF GENERATING PARTICULAR HARMONICS  
A67-10759
- RADIATION OF GIANT PULSES OF SUPERLUMINESCENCE BY  
HIGHLY EXCITED ACTIVE MEDIUM OF ND GLASS WITH  
RAPID CUT-IN OF AMPLIFICATION  
A67-10837
- POSSIBLE OSCILLATION MODES IN CYLINDRICAL SOLID  
STATE LASER AND DEPENDENCE OF PUMPING THRESHOLD,  
OUTPUT POWER AND DIVERGENCE ANGLE ON RESONATOR  
LENGTH  
A67-13129
- EMISSION LOSSES IN SOLID STATE LASER RESONATOR  
CALCULATED FOR ND GLASS LASER  
A67-13133

- MODE CHARACTERISTICS OF SOLID STATE LASERS FROM ANALYTICAL SOLUTION OF CONSERVATIVE EQUATION  
A67-13208
- PHASE AND AMPLITUDE FLUCTUATION OF GAS AND SOLID STATE LASERS, ACCOUNTING FOR NOISE CAUSED BY PUMPING, INCOHERENT DECAY, LATTICE VIBRATIONS AND ATOMIC COLLISIONS  
A67-14949
- NEODYMIUM-GLASS LASER USING SPONTANEOUS AMPLIFIED EMISSION IN NONRESONANT SYSTEM TO OBTAIN HIGH BRIGHTNESS OUTPUT PULSE  
A67-15100
- FISSION OR RADIOISOTOPIC NUCLEAR RADIATION APPLIED TO LASER PUMPING, DISCUSSING FORMS, SOURCES, POWER, SOLID STATE AND MOLECULAR GAS LASERS, ENERGY TRANSFER, OPTICAL FLUORESCENCE AND CUT-OFF PHENOMENON  
A67-16547
- NEODYMIUM DOPED OPTICAL GLASSES FOR LASER TECHNOLOGY  
A67-16855
- RUBY AND NEODYMIUM GLASS LASERS SUM FREQUENCY GENERATION USING NONLINEAR ELECTRO-OPTICAL KDP CRYSTAL  
A67-17754
- NEODYMIUM GLASS LASER TIME CHARACTERISTICS AND SPECTRAL CHANGES DURING CONVERSION TO TRAVELING WAVE LASER  
A67-18782
- NEODYMIUM GLASS LASER WITH SPHERICAL MIRROR RESONATOR IN STATIONARY REGIME  
A67-18783
- RCA PAPERS ON LASER RESEARCH AND ENGINEERING  
A67-19079
- YAG SOLID STATE LASER SYSTEM, DISCUSSING OUTPUT, THEORETICAL LIMITS, PERFORMANCE CHARACTERISTICS, ETC  
A67-19084
- STEADY STATE LASER DESIGN, COMPARING BALANCE METHOD WITH METHOD BASED ON QUASI-CLASSICAL THEORY  
A67-20245
- SOLID STATE PHYSICS**  
OPERATION AND IMPROVEMENT OF FREQUENCY MODULATED AND SUPER-MODE LASERS  
IER-3  
N66-30672
- SPONTANEOUS AND INDUCED COHERENT RADIATION FROM INDIUM ANTIMONIDE ELECTRON-HOLE PLASMA  
A67-10088
- SOLVENT**  
PUMPING OF ORGANIC DYES IN ORGANIC SOLVENTS, USING PULSED RUBY LASER  
A67-12515
- SOUND VELOCITY**  
STIMULATED BRILLOUIN SCATTERING FROM NITROGEN AND METHANE USING GIANT PULSE LASER, NOTING CONVERGENCE ANGLE OF BACKSCATTERED BEAM SOUND, VELOCITY MEASUREMENT, ETC  
A66-32627
- BRILLOUIN SPECTRA OF ACETONE, ETHYL ALCOHOL, WATER, CARBON BISULFIDE, TOLUENE, AND CARBON TETRACHLORIDE USING HELIUM-NEON LASER AND PHOTOELECTRIC DETECTION  
N66-35529
- SOUND WAVE**  
TRAJECTORIES OF LIGHT RAYS THROUGH MEDIUM SUBJECTED TO ACOUSTIC WAVES EXAMINED KNOWING THAT ACOUSTIC WAVES IN LASER MEDIUM FUNCTION AS OPTICAL WAVEGUIDE  
A66-38238
- 10.6 MICRON OUTPUT OF CARBON DIOXIDE-HE LASER MODULATED, USING BRAGG DIFFRACTION FROM LONGITUDINAL ACOUSTIC WAVES IN TE  
A66-42251
- CONFIGURATIONS FOR REALIZATION OF MULTIPLE LASER LIGHT SCATTERING USING MICROWAVE ACOUSTIC WAVES AND TWO PORRO PRISMS  
A66-42636
- CONTINUOUSLY VARIABLE OPTICAL DELAY LINE USING ACOUSTIC WAVES TO DIFFRACT AND FREQUENCY SHIFT PORTION OF ARGON ION LASER BEAM  
A67-12517
- SPACE COMMUNICATION**  
OPTICAL COMMUNICATION FOR MARS EXPLORATION WITH OUTLINE OF LASER MODULATORS AND ANTENNAS  
A66-25251
- LASER AND MASER DEVELOPMENT, DISCUSSING DESIGN IMPROVEMENTS AND APPLICATION FOR TELEVISION, SPACE COMMUNICATIONS, ETC  
A66-32353
- COMMUNICATION SYSTEMS AT MICROWAVE AND OPTICAL FREQUENCIES FOR FUTURE MARS MISSIONS  
A66-33793
- SYSTEM DESIGN ANALYSIS OF LASER METHODS OF DEEP SPACE COMMUNICATION, EXAMINING LOCAL HETERODYNE SYSTEM / LHS/, DIRECT DETECTION SYSTEM / DDS/ AND TRANSMITTED REFERENCE SYSTEM  
A66-35666
- RUBY LASERS IN SPACE COMMUNICATION  
FTD-TT-65-1683/164  
N66-26501
- PROGRAM PLANNING, GROUND SUPPORT AND AIRBORNE EQUIPMENT FOR LASER SPACE COMMUNICATION SYSTEM  
NASA-CR-78855  
N66-39446
- PROGRAM SPECIFICATIONS FOR LASER SPACE COMMUNICATION STUDY  
NASA-CR-78856  
N66-39447
- PROGRAM PLANNING TO DETERMINE ATMOSPHERIC EFFECTS ON LASER SPACE-GROUND COMMUNICATION SYSTEM  
NASA-CR-78854  
N66-39448
- SYSTEM DESIGN ANALYSIS OF LASER METHODS OF DEEP SPACE COMMUNICATION, EXAMINING LOCAL HETERODYNE SYSTEM / LHS/, DIRECT DETECTION SYSTEM / DDS/ AND TRANSMITTED REFERENCE SYSTEM  
A67-17635
- TUNABLE TRAVELING WAVE MASER FOR DEEP SPACE COMMUNICATIONS AND PLANETARY RADAR  
JPL-TR-32-1072  
N67-17168
- LARGE APERTURE TELESCOPE FOR USE AS COHERENT OPTICAL DEEP SPACE COMMUNICATIONS RECEIVER  
NASA-CR-81677  
N67-17946
- SPACE MECHANICS**  
AEROSPACE TECHNOLOGY RESEARCH IN U.S.S.R. - LASER ACTION BY SUPERCOOLED PLASMA, LITHIUM CRYSTAL GROWTH, METALLOSILOXANE POLYMER SYNTHESIS AND SPACE TECHNOLOGY CINEMATOGRAPHY  
N66-32699
- SPACE RADIATION**  
COHERENT AMPLIFICATION OF RF RADIATION IN COSMIC SPACE  
A66-42754
- EFFECTS OF SPACE RADIATION ON LASERS  
NASA-CR-79108  
N66-39911
- COHERENT AMPLIFICATION OF RF RADIATION IN COSMIC SPACE  
A67-10836
- SPACE-TIME FUNCTION**  
EFFECTIVE DIFFUSION CROSS SECTION OF ULTRASONIC AND LASER BEAM WHILE ACTING ON TURBULENT FLOW  
A66-25404
- INITIAL PULSE IN LUMINOUS EMISSION OF DISCHARGE LASER, USING PHOTOMULTIPLIER PRECEDED BY MOBILE IRIS, DETERMINING GEOMETRICAL DISTRIBUTION OF DISCHARGE BRIGHTNESS  
A66-31209
- SPACECRAFT COMMUNICATION**  
ACQUISITION AND REACQUISITION IN SPACECRAFT-SPACECRAFT AND SPACECRAFT-TO-EARTH COMMUNICATIONS USING LASER SYSTEMS  
A66-33795
- SPACECRAFT COMMUNICATIONS SYSTEM**  
SPACE COMMUNICATION REQUIREMENTS USING LASERS AND MICROWAVES IN MANNED MARS FLIGHTS  
ATAA PAPER 65-324  
A66-33794
- SPACECRAFT MODEL**  
LASER TECHNIQUES FOR DETECTING AND MEASURING VIBRATIONS OF SPACECRAFT MODEL ON SHAKE TABLE  
NASA-CR-75643  
N66-27953

## SPACECRAFT PROPULSION

INTERSTELLAR VEHICLE PROPELLED BY TERRESTRIAL  
LASER BEAM A66-35488

## SPARK

MAGNETIC DIPOLE MOMENT IN SPARK PRODUCED BY  
FOCUSING LASER RADIATION A66-43055

## SPARK DISCHARGE

ELECTRON DENSITY IN LASER-INDUCED SPARK IN AIR  
DETERMINED, MEASURING SIMULTANEOUSLY FUNDAMENTAL  
LASER WAVELENGTH AND SECOND HARMONIC A66-28685

SPECTROCHEMICAL ANALYSIS OF SOLID SPECIMEN FROM  
VAPOR FORMED BY LASER BEAM AND EXCITED BY SPARK  
DISCHARGE A67-16786

## SPARK GAP

PULSE-CURRENT DELAY TIME EFFECT ON LASER TRIGGERED  
HIGH VOLTAGE SPHERE-SPHERE GAP  
AFWL-TR-65-32 N66-25900

## SPARK PHOTOGRAPHY

SHAPE AND DIMENSION OF SPARK ARISING DURING  
FOCUSING OF LASER EMISSION A66-29210

SHAPE AND DIMENSION OF SPARK ARISING DURING  
FOCUSING OF LASER EMISSION A66-33059

## SPATIAL DISTRIBUTION

SPATIAL DISTRIBUTION OF ELECTRICAL FIELD OBTAINED  
BY FOCUSING RADIATION OF RUBY LASER A66-25967

SPATIAL SELECTIVE FADING AS RANDOM PROCESS,  
DISCUSSING SPATIAL COHERENCE, WAVE NUMBER  
DISPERSION PROFILE, TIME DELAY PROFILE, ETC, IN  
IONOSPHERIC PROPAGATION A66-26859

DYNAMICS OF NARROWING EFFECT OF SURFACE AND  
SPATIAL DISPERSING AGENTS ON RADIATION LINE OF  
RUBY LASER WITH NONRESONANCE FEEDBACK A67-18797

## SPECTRAL ANALYSIS

VELOCITY AND LIFETIME OF MICROWAVE THERMAL PHONONS  
IN LIQUIDS AND SOLIDS DETERMINED BY SPECTRUM OF  
LIGHT SCATTERING FROM LASER ILLUMINATED SAMPLE  
A66-26166

LASER ACTION IN GALLIUM ANTIMONIDE DIODES,  
EXAMINING EMITTED LIGHT SPECTRUM VS INJECTED  
CURRENT, TEMPERATURE EFFECT, RADIATIVE EFFICIENCY,  
ETC A66-26184

STIMULATED RAMAN EFFECT IN ACETONE AND ACETONE-  
CARBON DISULFIDE MIXTURES, NOTING SIMILARITY OF  
STOKES RADIATION PATTERN TO RAMAN EFFECT  
A66-28881

FREQUENCY STABILITY AND SPECTRAL PURITY OF P-N  
JUNCTION LASER OUTPUT IMPROVED BY SYNCHRONIZATION  
WITH GAS LASER BEAM A66-29717

HYPERFINE SPECTRUM OF XENON IN 3.5 MM MASER  
TRANSITION NOTING EXPERIMENTAL SETUP, GAIN  
PROFILES FOR VARIOUS INPUT POWER LEVELS AND  
STRUCTURAL PROPERTIES A66-38763

SPECTRAL ANALYSIS OF LASER DISCHARGE IN PURE AND  
IMPURE HE, OBTAINING SPECTRA OF SPARK AT VARIOUS  
PRESSURES, DETERMINING ELECTRON CONCENTRATION AT  
VARIOUS STAGES A66-40946

SCATTERED LIGHT SPECTRUM IN THETATRON PLASMA,  
NOTING ONSET OF ION WAVE INSTABILITY A67-10248

ELECTRON RECOMBINATION IN LASER PRODUCED HYDROGEN  
DISCHARGE, NOTING TEMPERATURE DECAY DUE TO  
RADIATION, EXPANSION COOLING AND ELECTRON LOSS  
A67-15109

SPECTROCHEMICAL ANALYSIS OF SOLID SPECIMEN FROM  
VAPOR FORMED BY LASER BEAM AND EXCITED BY SPARK  
DISCHARGE A67-16786

## SPECTRAL BAND

SPECTRAL PROPERTIES OF ND DOPED YTTRIUM VANADATE  
GROWN FROM MELT, NOTING REDUCED STARK SPLITTING  
LEADING TO LASER ACTION A67-19559

## SPECTRAL EMISSION

SPECTRAL COMPOSITION OF LASER LIGHT WITHIN  
FRAMEWORK OF THEORY OF NONLINEAR OPTICAL EFFECTS  
A66-29356

SPECTRAL COMPOSITION OF LASER LIGHT WITHIN  
FRAMEWORK OF THEORY OF NONLINEAR OPTICAL EFFECTS  
A66-37360

## SPECTRAL ENERGY DISTRIBUTION

LIGHT SHIFT, LIGHT MODULATION AND PHASE PULLING IN  
OPTICALLY PUMPED RUBIDIUM MASER A66-26202

SPECTRAL DISTRIBUTION OF RUBY LUMINESCENCE YIELD,  
NOTING ABSORPTION COEFFICIENT AND EXCITATION  
BAND A66-33509

SPECTRAL DISTRIBUTION OF RUBY LUMINESCENCE YIELD,  
NOTING ABSORPTION COEFFICIENT AND EXCITATION BAND  
A66-42123

## SPECTRAL LINE

NONLINEAR LIGHT SCATTERING IN PRESSURIZED METHANE,  
NOTING DISPLACEMENT OF SPECTRAL LINE FROM LASER  
FREQUENCY A66-26148

HELIUM-NEON LASER EMISSION ON 6401 ANGSTROM LINE,  
NOTING INTENSITY VS MIRROR SHIFT AND OPTICAL  
CAVITY INSTABILITY A66-26336

LASER LINES DUE TO ENERGY TRANSFER FROM COLOR  
CENTERS TO ERBIUM IONS IN CALCIUM FLUORIDE  
CRYSTALS IRRADIATED BY GAMMA RAY A66-30278

PASCHEN SERIES LASER LINES IN ATOMIC AND  
MOLECULAR HYDROGEN A66-40892

TRANSITIONS OF FIRST TWO BAND SYSTEMS OF IODINE  
EXCITED IN ARGON SUITABLE FOR LASER ACTION  
A66-42085

LASER LINES OF PULSED DISCHARGE IN IODINE VAPOR  
A67-10549

LASER LINES OF PULSED DISCHARGE IN IODINE  
VAPOR A67-11057

RELATIVE INTENSITIES AND CASCADE TRANSITION RATIO  
IN CW AR II LASER NEAR 4103.9 ANGSTROMS  
A67-19560

AXIAL MAGNETIC FIELD EFFECT ON NE- HE LASER POWER  
OUTPUT OPERATING IN REGIME OF SIMULTANEOUS  
GENERATION OF 3.39 AND 0.6328 MICRON LINES  
A67-19601

## SPECTRAL LINE WIDTH

HE- NE LASER HOMODYNE SPECTROMETER OBSERVATION OF  
BROADENING OF SPECTRAL PROFILE OF LIGHT SCATTERED  
FROM CARBON DIOXIDE NEAR CRITICAL TEMPERATURE AND  
DENSITY DUE TO DENSITY FLUCTUATIONS A66-26168

GIANT-PULSE LASER-INDUCED ATMOSPHERIC ELECTRIC  
BREAKDOWN CAUSING OPTICAL FREQUENCY DISCHARGE  
A66-26194

FAR- IR LASER MOLECULAR SPECTROSCOPY INCLUDING IR  
LASER OSCILLATORS, PHOTON NOISE, DETECTORS AND  
NUCLEAR OPTICS A66-26195

OPTICAL- AND I R-MASER SPECTROSCOPY OF  
INHOMOGENEOUSLY BROADENED RESONANCES, USING GAS  
LASERS A66-26196

NONLINEAR QUANTUM MECHANICAL ANALYSIS OF LASER  
STEADY MOTION, STABILITY UNDER DEVIATIONS AND  
NOISE EFFECT ON LINE WIDTH AND INTENSITY  
FLUCTUATIONS A66-26213

COLLISION BROADENED LINEWIDTH AND SATURATION  
PARAMETERS FOR 6328 ANGSTROM TRANSITION OF NE IN

- HE- NE LASER A66-31084
- MINIMUM SPECTRAL LINE WIDTH, THRESHOLD CURRENT DENSITY, RADIATION-PEAK DISPLACEMENT AND POSSIBLE RECOMBINATION MECHANISM FOR GA SB LASER DIODE P-N JUNCTIONS IN COHERENT RADIATION A66-31764
- FREQUENCY SHIFT RELATIVE TO SPECTRAL WIDTH FOR SINGLE PULSES OF TRIGGERED LASER DETERMINED BY MEASURING VARIATIONS OF EMITTED WAVELENGTH AS FUNCTION OF TIME A66-32622
- SPECTRAL HOLE BURNING AND CROSS RELAXATION EFFECTS ON STEADY STATE GAIN SATURATION OF LASER AMPLIFIER WITH INHOMOGENEOUSLY BROADENED LINEWIDTH A66-40098
- SPECTRAL WIDTH OF PEAK TYPE AND MONOPULSE TYPE RADIATION OF SOLID-BODY LASER IN NONSTATIONARY REGIME A66-42133
- MINIMUM SPECTRAL LINE WIDTH, THRESHOLD CURRENT DENSITY, RADIATION-PEAK DISPLACEMENT AND POSSIBLE RECOMBINATION MECHANISM FOR GA SB LASER DIODE P-N JUNCTIONS IN COHERENT RADIATION A67-10085
- TUNABLE DISPERSION RESONATOR AND BROADENING OF LASER EMISSION SPECTRAL RANGE TO OBTAIN OPERATING FREQUENCY OTHER THAN FUNDAMENTAL A67-13131
- EFFECT OF DOPPLER AND IMPACT LINE BROADENING OF SPECTRAL CHARACTERISTICS OF GAS LASER, NOTING STANDING MONOCHROMATIC WAVE SATURATION A67-14197
- GENERALIZED CALLEN- WELTON THEOREM APPLIED TO CALCULATION OF MASER OSCILLATIONS IN AMPLIFICATION AND GENERATION REGIMES, DETERMINING NOISE SPECTRAL ENERGY AND SPECTRAL LINE WIDTH A67-16350
- GAS LASER PUMPED MICROWAVE EMISSION FOR PRODUCING CONTROLLED EXCITED STATE POPULATION FOR RF SPECTROSCOPY OF NEON A67-16638
- DOPPLER AND IMPACT BROADENING OF SPECTRAL LINES AND PRESSURE EFFECTS ON POWER OUTPUT OF GAS LASER A67-16643
- OUTPUT SPECTRA OF ND DOPED YAG AND RUBY LASERS, DETERMINING MECHANISMS RESPONSIBLE FOR OBSERVED OVERALL LINEWIDTHS A67-16660
- WAVELENGTH DEPENDENCE OF SPECTRUM OF LASER BEAMS TRAVERSING ATMOSPHERE A67-16793
- TIME STRUCTURE AND AMPLITUDE SELF-MODULATION OF EMISSION FROM GA AS INJECTION LASER OBSERVED, USING ELECTRON-OPTICAL CONVERTER A67-17756
- HIGH POWER CARBON DIOXIDE LASER HETERODYNE DETECTION OF BEATS AND LINEWIDTH MEASUREMENTS A67-17891
- SPECTROGRAPHY**  
MASERS AS EXCITATION MEANS FOR SPECTROGRAPHIC EXAMINATION OF METAL MICROSTRUCTURE AD-632240 N66-29847
- SPECTROMETER**  
ALIGNMENT OF ANGULAR POSITIONS OF SPHERICAL MIRROR AND GRATING OF FASTIE- EBERT SPECTROMETER, USING BRIGHT COLLIMATED MONOCHROMATIC BEAM OF HE- NE LASER A66-26564
- SPECTROMETRY**  
RAMAN SCATTERING STUDIES USING CONTINUOUS WAVE OPTICAL MASERS AND SPECTROMETERS MIT-DSR-4979 N66-27897
- SPECTROSCOPY**  
TWO-LASER CAVITY IN TANDEM TO RESOLVE COMPONENTS WITH HOMOGENEOUSLY BROADENED / DOPPLER/ LINE A66-36720
- SPECTROSCOPY**  
EXCITATION RADIATION TRANSFER FROM TRIVALENT CHROMIUM TO NEODYMIUM EXAMINED VIA FLUORESCENCE SPECTROSCOPY, NOTING ENERGY TRANSFER PARAMETERS AND EFFECT ON LASER OUTPUT A66-26175
- MONOGRAPH ON LASERS INCLUDING GAS LASERS, RUBY LASERS, GIANT-PULSE TECHNIQUES, OSCILLATION MODES, ETC A66-26961
- MEASUREMENT OF SINGLE LINE IN P BRANCH OF CARBON DIOXIDE VIBRO-ROTATIONAL ABSORPTION BAND USING TUNED OPTICAL MASER SPECTROSCOPY, NOTING PRESENCE OF SHIFTED FREQUENCIES A66-28691
- OPTICAL COHERENCE FUNCTIONS AND PROPERTIES FROM STATISTICAL VIEWPOINT FOR APPLICATION TO SPECTROSCOPY AND STELLAR INTERFEROMETRY A66-31987
- SPECTROSCOPIC AND MICROWAVE INVESTIGATION OF LASERING PLASMAS, ELECTRON GAS, AND EXCITED STATE POPULATIONS OF ACTIVE MEDIUM A66-66-89 N66-26570
- PLASMA PROPERTIES USING LASERS AND SPECTROSCOPY - TRANSMISSION DESIGN REQUIREMENTS FOR AIRCRAFT GAS TURBINES N66-27060
- LASER MICROPROBE AS EXCITATION SOURCE FOR EMISSION SPECTROCHEMICAL ANALYSIS A66-65-855/1/ N66-29249
- FERROELECTRIC MATERIALS FOR LIGAND FIELD MASER IN MILLIMETER RANGE - LIGAND FIELD NEAR GROUND STATE CROSSED MEASURED BY OPTICAL AND MICROWAVE SPECTROSCOPY MC-64-102-R2 N66-39741
- LASER STUDIES AT RCA VICTOR RESEARCH LABORATORIES, MONTREAL, DISCUSSING SPECTROSCOPIC, INTERFEROMETRIC AND PLASMA DIAGNOSTIC RESEARCH A67-19082
- LASER SPECTROSCOPY, DISCUSSING ADVANTAGES, PRECISION ATTAINABLE, LINE SHAPE AND POSITION MEASUREMENTS A67-19087
- JOURNAL OF APPLIED SPECTROSCOPY ARTICLES ON RUBY LASERS AND ACTIVATED ALKALI HALIDE SCINTILLATORS FTD-HT-66-310 N67-17169
- SPHERE**  
DIFFUSELY TRANSMITTING INTEGRATING SPHERE WITH SOLID STATE PHOTODIODE USED IN LASER OUTPUT MEASUREMENT A67-10445
- SPIN**  
PHOTON ECHO, OPTICAL ANALOG OF SPIN ECHO, IN RUBY CRYSTALS, USING RUBY LASER AS EXCITATION SOURCE A66-26170
- SPIN DYNAMICS**  
MASER SPIN DYNAMICS NASA-TM-X-55675 N67-18747
- SPIN-LATTICE RELAXATION**  
INVERTED SUSCEPTIBILITY, INVERSION RATIO, LINE WIDTHS AND SPIN-LATTICE RELAXATION TIMES FOR MASER OPERATION POINT IN CHROMIUM-DOPED COBALT POTASSIUM CYANATE A66-30934
- MAGNETIC FIELD GRADIENT RELAXATION MECHANISM BY RANDOM EXCITATION OF TRANSITIONS IN F EQUALS 1 LEVEL OF GROUND STATE OF HYDROGEN ATOMS IN MASER A67-16635
- X-BAND RUBY MASER DESIGN WITH LIQUID HYDROGEN COOLING FOR HIGH GAIN AT LOW PUMPING POWER A67-19131
- MASER SPIN DYNAMICS NASA-TM-X-55675 N67-18747
- SPIN-ORBIT INTERACTION**  
SPONTANEOUS AND COHERENT EMISSION FROM LEAD SULFIDE, TELLURIDE AND SELENIDE DIODE LASERS IN ORIENTED MAGNETIC FIELD, DETERMINING BAND EDGE PARAMETERS FROM SPIN-SPLIT ZERO ORDER LANDAU

- LEVEL TRANSITIONS A66-26185
- VALENCE BAND SPIN-ORBIT SPLITTING IN HIGHLY DEGENERATE SEMICONDUCTORS DETERMINED FROM SPLITTING OF PEAK LASER DIODE EMISSION IN HIGH MAGNETIC FIELDS A66-36036
- EIGENVALUES AND EIGENFUNCTIONS OF SPIN HAMILTONIAN AND MATRIX ELEMENTS OF SPIN OPERATOR OF RUBY A66-37584
- SPONTANEOUS EMISSION**
- 1.60 MICRON STIMULATED AND SPONTANEOUS EMISSIONS FROM EPITAXIAL SINGLE CRYSTALS IN QUASI-BINARY III-V COMPOUND SEMICONDUCTOR DIODES OF INJECTION LASERS AT 77 DEGREES K A66-39750
- SPONTANEOUS EMISSION IN INVERSELY POPULATED MEDIUM EXAMINED FOR UNIFORM RUBY ROD LASER WITH UNIFORM PUMPING DISTRIBUTION A66-41450
- SPONTANEOUS EMISSION SPECTRA AND RATIO OF NUMBER OF PHOTONS IN VARIOUS OSCILLATION MODES OF LASER WITH NONLINEAR FILTER TYPE LOCK A67-11573
- SPONTANEOUS EMISSION IN INVERSELY POPULATED MEDIUM EXAMINED FOR UNIFORM RUBY ROD LASER WITH UNIFORM PUMPING DISTRIBUTION A67-14186
- STABILIZATION**
- PROPERTIES OF FM AND SUPER-MODE HELIUM-NEON LASERS, AND ABSOLUTE FREQUENCY STABILIZATION OF FM LASER IER-4 N66-35096
- STABLE OSCILLATION**
- FREQUENCY STABILITY AND SPECTRAL PURITY OF P-N JUNCTION LASER OUTPUT IMPROVED BY SYNCHRONIZATION WITH GAS LASER BEAM A66-29717
- STANDARD**
- LASER ACCELERATOR CALIBRATOR AS STANDARD FOR VIBRATION DISPLACEMENT MEASUREMENTS N66-28461
- STANDING WAVE**
- SCATTERING OF ELECTRON BEAM BY STANDING WAVES OF PHOTONS INSIDE LASER CAVITY CORRESPONDS TO STIMULATED COMPTON EFFECT A66-26155
- SEMICLASSICAL THEORY OF QUANTUM GENERATORS, EXAMINING LASER SYSTEM RESPONSE TO EFFECT OF MONOCHROMATIC STANDING WAVE BASED ON KINETIC EQUATION FOR DENSITY MATRIX A66-30865
- GENERATING MODE NUMBER IN SOLID STATE LASERS USING TRAVELING WAVE AND STANDING WAVE A67-10069
- STATISTICAL ANALYSIS**
- STATISTICAL ANALYSIS OF LIGHT FIELDS CREATED BY SUPERPOSITION OF LASER LIGHT AND CHAOTIC LIGHT A66-29815
- OPTICAL COHERENCE FUNCTIONS AND PROPERTIES FROM STATISTICAL VIEWPOINT FOR APPLICATION TO SPECTROSCOPY AND STELLAR INTERFEROMETRY A66-31987
- REPLACEMENT OF POISSON BY POLYA DISTRIBUTION IN CALCULATING LASER INTENSITY THRESHOLD NECESSARY TO INDUCE IONIZATION BREAKDOWN IN GASES A66-39715
- AMPLITUDE AND FREQUENCY MEASUREMENT OF RANDOM POSITION FLUCTUATION OF STATIONARY LASER OPTICAL SOURCE DUE TO ATMOSPHERIC TURBULENCE NASA-TN-D-3439 N66-25558
- MULTIPHOTON ABSORPTION PROCESSES, COHERENCE OF RADIATION FIELDS AND STATISTICAL PROPERTIES OF LASER LIGHT ABSORPTION A67-16681
- LASER VELOCIMETER MEASUREMENT OF POINT VELOCITIES IN TURBULENT LIQUID FLOW IN PIPE, USING STATISTICAL ANALYSIS TO VERIFY RESULTS AIAA PAPER 67-179 A67-18511
- PARTICLE NUMBER FLUCTUATION IN SINGLE CELL OF KASTLER PHOTON SET, DISCUSSING STATISTICAL PROPERTIES OF LASER EMISSION IN MULTIMODE EXCITATION REGIME A67-19599
- STATISTICAL COMMUNICATION THEORY**
- LASER RADAR RANGING SYSTEM USING PSEUDORANDOM CODE MODULATION, CONSIDERING APPLICATION TO PULSE AND DIGITAL CIRCUITRY, STATISTICAL COMMUNICATION THEORY AND ELECTRO-OPTICAL ENGINEERING A66-33557
- STATISTICAL DISTRIBUTION OF AM LASER SIGNAL ENVELOPE UPON PASSAGE THROUGH TURBULENT ATMOSPHERE A67-13988
- STATISTICAL MECHANICS**
- STEADY STATE LASER DESIGN, COMPARING BALANCE METHOD WITH METHOD BASED ON QUASI-CLASSICAL THEORY A67-20245
- STATISTICAL PROBABILITY**
- PHOTOELECTRON EMISSION STATISTICS DETERMINING PROBABILITY DISTRIBUTION OF PHOTOELECTRON COUNTS IN PHOTOMULTIPLIER ILLUMINATED BY LASER BELOW AND ABOVE THRESHOLD OF OSCILLATION A66-42543
- ACCURACY AND LIMIT ANALYSIS OF STATISTICAL DISTRIBUTION OF EM RADIATION FIELD BY PHOTOELECTRON COUNTING DISTRIBUTIONS FROM PHOTODETECTOR FOR SINGLE MODE LASER NEAR THRESHOLD A67-16624
- STEADY STATE**
- STEADY STATE REGIME OF ELECTROMAGNETIC OSCILLATION IN LASER A66-27065
- STEADY STATE OSCILLATIONS OF MOLECULAR BEAM LASER WITH INHOMOGENEOUS SINUSOIDAL FIELD IN RESONATOR A66-32243
- STEADY STATE REGIME OF ELECTROMAGNETIC OSCILLATION IN LASER A66-40824
- ANALYSIS AND STEADY STATE SOLUTION FOR USING ONE RUBY LASER ROD TO PUMP ANOTHER, IN ORDER TO REDUCE OPTICAL PATH DISTORTIONS N66-28555
- STEADY STATE LASER RADIATION DURING RELAXATION, DISCUSSING TIME-DEPENDENT SPECTRAL COMPOSITION, OSCILLATION MODES AND POLARIZATION CHARACTERISTICS A67-13134
- STEADY STATE REGIME AND STABILITY OF TWO-PHOTON LASER, NOTING FIELD DEPENDENCE OF INTENSITY AND DURATION OF FREQUENCY PULSE AND RESONANCE EXCITATION CURVES A67-14745
- SEMICLASSICAL AND RATE EQUATIONS COMPARED FOR DETERMINATION OF OUTPUT POWER OF STEADY STATE RUBY LASER A67-16628
- TRANSIENT AND STEADY STATE IR EMISSION FROM LOW-LYING VIBRATIONAL LEVELS OF CARBON DIOXIDE IN LASER SYSTEMS, USING DC DISCHARGE A67-16630
- QUENCHING OF ONE PULSED RUBY LASER OSCILLATION BY ANOTHER, NOTING COUPLED RATE EQUATIONS FOR STEADY STATE AND TRANSIENT BEHAVIOR A67-16682
- STEADY STATE LASER DESIGN, COMPARING BALANCE METHOD WITH METHOD BASED ON QUASI-CLASSICAL THEORY A67-20245
- CALCULATIONS AND EXPERIMENTS TO DETERMINE ION WAVE INSTABILITY IN STEADY STATE DISCHARGE, LASER BREAKDOWN IN PLASMA, AND MICROWAVE SCATTERING FROM STANDING PLASMA WAVES N67-14628
- STEEL**
- LASER BEAM EFFECT ON HARDENING OF STEEL A66-31802
- STEEL STRUCTURE**
- TREATMENT OF STEEL WITH LASER BEAM, OBTAINING PRECISION HOLES WITHOUT AFFECTING MICROHARDNESS OF METAL A67-18234

- STEERABLE ANTENNA  
LASER SYSTEM FOR MEASURING SURFACE CONTOURS IN  
LARGE STEERABLE ANTENNAS A66-34296
- STEP FUNCTION  
Q MODULATION OF LASER THEORY AND APPLICATION,  
PRESENTING GIANT PULSE PRODUCTION,  
PHENOMENOLOGICAL THEORY, OUTPUT RESPONSE TO STEP  
FUNCTION CHANGE, ELECTRO-OPTIC AND MECHANICAL  
MODULATORS A66-36971
- STEREOSCOPIC PHOTOGRAPHY  
THREE-DIMENSIONAL HOLOGRAPHY  
NEL-1403 N67-16644
- STIMULATED EMISSION  
ANGULAR DISTRIBUTION OF STIMULATED RAMAN  
RADIATION, DISCUSSING AXIAL AND OFF-AXIAL STOKES  
AND SURFACE RADIATION MECHANISM A66-25189
- I R LASER RADIATION WITH POWER OF 5.7 WATTS IN  
VICINITY OF 10.69 MU IN SEALED TUBE CONTAINING  
PURE CARBON DIOXIDE EXCITED BY AC OR DC CURRENT  
A66-25410
- INTERACTION BETWEEN STIMULATED BRILLOUIN AND  
RAMAN SCATTERING IN CARBON SULFIDE, USING OPTICAL  
RESONATOR AND LASER BEAM A66-26162
- MULTIPLE STIMULATED BRILLOUIN EMISSION EXHIBITED  
BY LIQUIDS EXPOSED TO PULSED RUBY LASER, NOTING  
SCATTERING EVENTS, STOKES ORDERS IDENTIFICATION  
AND ITERATION MECHANISM A66-26164
- STIMULATED EMISSION FROM ELECTRON BEAM EXCITATION  
OF TELLURIUM AND PURE AND N-TYPE DOPED INDIUM  
ANTIMONIDE IN SEMICONDUCTOR LASERS A66-26179
- I R MASER ACTION ON VIBRATIONAL TRANSITIONS OF  
THERMALLY PUMPED POLYATOMIC MOLECULES A66-26203
- SUPERRADIANCE IN N-TYPE GALLIUM ARSENIDE AT ROOM  
TEMPERATURE EXCITED BY ELECTRON BEAM A66-27028
- LASER OSCILLATOR STUDY OF COHERENT STIMULATED  
EMISSION OF IR TRANSITIONS IN RARE GASES A66-27336
- LASER-GENERATION-TYPE LUMINESCENCE CD S- CD SE  
CRYSTALS EXPOSED TO DOUBLE PHOTON EXCITATION FROM  
RUBY LASER A66-27647
- STIMULATED RAMAN EFFECT IN ACETONE AND ACETONE-  
CARBON DISULFIDE MIXTURES, NOTING SIMILARITY OF  
STOKES RADIATION PATTERN TO RAMAN EFFECT A66-28881
- STIMULATED EMISSION FROM SAMARIUM-DOPED CALCIUM  
FLUORIDE CRYSTAL EXCITED BY RUBY LASER A66-29358
- LENGTH DEPENDENT THRESHOLD DATA FOR STIMULATED  
RAMAN EMISSION IN LIQUIDS, NOTING CORRELATION  
BETWEEN LASER BEAM SELF-FOCUSING AND ONSET OF  
RAMAN EMISSION A66-30157
- MULTIPHOTON PLASMA PRODUCTION AND STIMULATED  
RECOMBINATION RADIATION IN LEAD TELLURIDE,  
CONSIDERING ELECTRON-HOLE PAIR PRODUCTION RATE  
A66-31884
- EFFECT OF ANOMALOUS DISPERSION ON STIMULATED  
EMISSION SPECTRUM OF DOPED CADMIUM FLUORIDE  
CRYSTALS A66-32317
- BOOK ON LASER THEORY BASED ON KINETIC EQUATIONS  
WITH EMPHASIS ON EMISSION FROM LUMINESCENT CENTER  
TRANSITIONS, SEMICONDUCTOR JUNCTIONS AND RAMAN  
SCATTERING A66-32558
- SEMICONDUCTOR LIGHT EMISSION MECHANISMS EXAMINED  
INCLUDING WAVELENGTH EMITTED, WIDTH OF RAY EMITTED  
AND EFFICIENCY OF EMISSION A66-36263
- STIMULATED EMISSION FROM SAMARIUM-DOPED CALCIUM  
FLUORIDE CRYSTAL EXCITED BY RUBY LASER A66-37362
- LASER EMISSION INTERFEROGRAMS OBTAINED WITH  
FABRY-PEROT CROSS-GRATING INTERFEROMETER IN  
SUBMILLIMETER WAVELENGTH RANGE A66-37546
- SUBMILLIMETER LASER EMISSION FROM ICN NOTING  
INTERFEROGRAMS A66-37547
- STIMULATED EMISSION SPECTRUM IN AXIAL-MODE MODEL  
OF PLANE RESONATOR IN STATIONARY GENERATION REGIME  
A66-38127
- STIMULATED EMISSION, ABSORPTION SPECTRA AND  
LUMINESCENCE OF NEODYMIUM-ACTIVATED YAG CRYSTALS  
IN PULSED LASER A66-39306
- 1.60 MICRON STIMULATED AND SPONTANEOUS EMISSIONS  
FROM EPITAXIAL SINGLE CRYSTALS IN QUASI-BINARY  
III-V COMPOUND SEMICONDUCTOR DIODES OF INJECTION  
LASERS AT 77 DEGREES K A66-39750
- POWERFUL LASER EMPLOYING INDUCED TWO-QUANTA  
LUMINESCENCE A66-39771
- SPECTRAL AND TIME-DEPENDENT CHARACTERISTICS OF  
STIMULATED RADIATION FROM RUBY PULSE LASER, USING  
FABRY-PEROT ETALON IN FINE-STRUCTURE OBSERVATION  
A66-39823
- STIMULATED EMISSION OF POLYMETHINE DYES UPON  
PUMPING WITH Q-SWITCHED LASER, NOTING WAVELENGTH  
PARAMETERS AND OSCILLATION A66-42247
- MOLECULAR OSCILLATION DIFFERENCE FREQUENCY  
GENERATION IN IR SPECTRUM BY BEATING TOGETHER  
LASER AND LASER-STIMULATED RAMAN EMISSION  
A66-42544
- TRANSVERSE GAIN AND SPONTANEOUS AND STIMULATED  
EMISSION AT 8466 ANGSTROMS IN GaAs STRUCTURES  
A66-42561
- CONVERSION EFFICIENCY AND THRESHOLD OF STIMULATED  
RAMAN EMISSION IN BENZENE, NITROBENZENE,  
TOLUENE, AND CARBON DISULFIDE - DEFENDER  
PROJECT N66-36239
- MASERS AND LASERS FROM EINSTEIN DISCOVERY OF  
STIMULATED EMISSION TO PRESENT A67-10503
- TEMPERATURE DEPENDENCE OF THRESHOLD FOR STIMULATED  
EMISSION OF ND TRIVALENT ION IN SEVERAL HOST  
LATTICES ESTIMATED FROM INTENSITY VARIATION OF  
LASER ACTIVE FLUORESCENCE COMPONENT A67-11085
- SELF-EXCITATION OF NONSTEADY PROCESSES IN TWO-  
PHOTON LASER A67-12421
- POWERFUL LASER EMPLOYING INDUCED TWO-QUANTA  
LUMINESCENCE A67-12856
- LINEAR PHASE DISTORTIONS OF PLANE RESONATOR WITH  
TILTED MIRRORS AND EFFECTS ON GENERATION OF  
STIMULATED EMISSION IN RUBY CRYSTAL LASER  
A67-13130
- TUNABLE DISPERSION RESONATOR AND BROADENING OF  
LASER EMISSION SPECTRAL RANGE TO OBTAIN OPERATING  
FREQUENCY OTHER THAN FUNDAMENTAL A67-13131
- EFFECT OF DIFFUSION OF EXCITATION ON CONDITIONS OF  
MULTIMODE GENERATION IN LASER RADIATION A67-13207
- POPULATION INVERSION OF UPPER LASER LEVEL OF  
CARBON DIOXIDE MOLECULES, NOTING ELECTRON-MOLECULE  
COLLISION AND EFFECT OF NEON ADDITION A67-13297
- TEMPORAL-SPATIAL VARIATION OF CROSS SECTIONAL FLUX  
DISTRIBUTION OF STIMULATED EMISSION FROM ND GLASS  
PULSED LASER A67-14280
- STIMULATED EMISSION BY ELECTRON BEAM BOMBARDMENT

- OF LASER MATERIALS A67-14394
- POPULATION INVERSION OF UPPER LASER LEVEL OF CARBON DIOXIDE MOLECULES, NOTING ELECTRON-MOLECULE COLLISION AND EFFECT OF NEON ADDITION A67-14722
- DEGENERATE STIMULATED FOUR-PHOTON INTERACTION AND FOUR-WAVE PARAMETRIC AMPLIFICATION OBSERVED IN RUBY LASER AND LIQUID CELL ARRANGEMENTS A67-16379
- LAMB SELF-CONSISTENT THEORY AND RATE EQUATION APPROXIMATION STUDY OF MAGNETIC DEPOLARIZATION OF VAPOR AND POLARIZATION OF MONOMODE GAS LASER IN MAGNETIC FIELD A67-16644
- DOUBLE RESONANCE EFFECTS EXTENDED TO CASE OF STIMULATED EMISSION IN EXCITED STATES OF NEON, USING GAS LASER IN TRANSVERSE DC MAGNETIC FIELD A67-16645
- LOSS MEASUREMENT FOR RUBY LASER RESONANT CAVITY, COMPARING THRESHOLDS FOR R SUB 1 AND R SUB 2 LINE OPERATION A67-16655
- LASER EMISSION AT 1.06 MICRONS FROM YTTERBIUM-NEODYMIUM GLASS, NOTING LINEARITY OF ENERGY TRANSFER WITH YB CONCENTRATION A67-16664
- SEMICONDUCTOR LASERS WITH RADIATING MIRRORS DEVELOPED BY EXCITATION, USING ELECTRON BEAM AND NEODYMIUM LASER GLASS RADIATION A67-16669
- HYPERSONIC EXCITATIONS DUE TO BRILLOUIN SCATTERING FOR CASE WITH STOKES FEEDBACK, DERIVING QUANTUM EQUATION OF MOTION FOR CREATION OF LASER AND STOKES MODES AND COUPLED ACOUSTIC MODE A67-16683
- ENHANCED LASING OF HIGH PRESSURE HE- NE LASER, COMMENTING ON DELAY TIME OF LIGHT PULSE EMITTING THROUGH WALLS OF DISCHARGE TUBE FROM START OF EXCITING PULSE A67-16687
- STIMULATED EMISSION IN TRIPLET SYSTEM OF NITROGEN MOLECULE PRODUCED BY PULSED LASER DISCHARGE, IDENTIFYING LINES AND INTERPRETING INTENSITY DISTRIBUTION IN ROTATIONAL BAND SPECTRUM A67-16785
- TRAVELING WAVE EXCITATION OF HIGH POWER NITROGEN AND NEON LASERS WITH VELOCITY MATCHING THAT OF STIMULATED EMISSION A67-20093
- STOKES LAW**
- EFFECT OF FLUCTUATING LASER PUMP ON STIMULATED RAMAN SCATTERING, NOTING GROWTH OF COUPLED STOKES-ANTI-STOKES WAVES IN PRESENCE OF TWO-MODE PUMP A66-26158
- STIMULATED STOKES EMISSIONS FROM RAMAN ACTIVE MEDIA OBSERVED BY USING Q-SWITCHED RUBY LASER WHICH EMITS MULTIPLE PULSE IN EACH SHOT A67-14765
- STOKES PARAMETER**
- STIMULATED RAMAN EFFECT IN ACETONE AND ACETONE-CARBON DISULFIDE MIXTURES, NOTING SIMILARITY OF STOKES RADIATION PATTERN TO RAMAN EFFECT A66-28881
- HYPERSONIC EXCITATIONS DUE TO BRILLOUIN SCATTERING FOR CASE WITH STOKES FEEDBACK, DERIVING QUANTUM EQUATION OF MOTION FOR CREATION OF LASER AND STOKES MODES AND COUPLED ACOUSTIC MODE A67-16683
- STRAIN RATE**
- PLASMA PHYSICS STUDIES - LASER INTERFEROMETER TO MEASURE STRAIN RATE AT KERN RIVER FAULT, PLASMA DIFFUSION, ALFVEN WAVES IN RELATIVISTIC WAVES, AND PLASMA RADIATION FROM SILVER FOILS N66-36419
- STREAK PHOTOGRAPHY**
- WRITING RATE OF ROTATING-MIRROR STREAK CAMERA
- DETERMINED, USING Q-SWITCHED LASER TECHNIQUE A66-30419
- COHERENT GAS LASER LIGHT TO MEET REQUIREMENTS OF STREAK PHOTOGRAPHY FOR TIME-RESOLVED FLOW VISUALIZATION A66-32959
- LASERS APPLIED TO PHOTO-OPTICAL INSTRUMENTATION PROBLEMS, DETAILING SCHLIEREN SYSTEMS, INTERFEROMETRY, HIGH SPEED STREAK PHOTOGRAPHY AND TRANSISSOMETER A67-12243
- STRESS CONCENTRATION**
- DYNAMIC PHOTOELASTICITY MEASUREMENTS OF STRESS CONCENTRATION, USING RUBY LASER MONOCHROMATIC LIGHT SOURCE A66-34557
- STRESS WAVE**
- HEAT TRANSFER AND STRESS WAVE EVOLUTION PRIOR TO ABLATION AND THERMAL EQUILIBRIUM IN EXPOSURE OF SOLID AND LIQUID MATERIALS TO LASER SOURCES A66-32638
- STRUCTURAL DESIGN**
- TECHNICAL ASPECTS AND USES OF GAS LASERS GUO-2177 N67-11969
- STRUCTURAL MATERIAL**
- LASER WELDING OF AEROSPACE STRUCTURAL ALLOYS AND RESULTANT JOINT PROPERTIES A66-26019
- SUBMILLIMETER WAVE**
- MARK I SMASER DESIGN, SUBMILLIMETER WAVE GAS LASER CAPABLE OF CONTINUOUS WAVE OR PULSE OPERATION A66-29009
- 118-MICRON WAVELENGTH WATER VAPOR GAS LASER WITH 4-INCH DIAMETER TWO-METER FOCAL LENGTH MIRROR RESONATOR SYSTEM A66-29010
- LASER EMISSION INTERFEROGRAMS OBTAINED WITH FABRY-PEROT CROSS-GRATING INTERFEROMETER IN SUBMILLIMETER WAVELENGTH RANGE A66-37546
- SUBMILLIMETER WAVELENGTH ELECTRONIC DEVICES, EXAMINING DEVELOPMENT OF LASERS AND REFLECTED WAVE TUBES WITH OVERLAPPING EFFECTIVE WAVE RANGE A66-38004
- MULTIPLE CYCLOTRON RESONANCE ABSORPTION LINES IN DEGENERATE VALENCE BANDS OF GE SEMICONDUCTOR STUDIED WITH FAR IR LASER SUBMILLIMETER SPECTROMETER A66-42545
- WATER VAPOR ABSORPTION SPECTRA IN SUBMILLIMETER WAVE REGION, ANALOG-TO-DIGITAL CONVERSION AND RECORDING SYSTEM, AND CARBON DIOXIDE LASER CONSTRUCTION NASA-CR-74971 N66-26261
- SUBMILLIMETER WAVELENGTH ELECTRONIC DEVICES, EXAMINING DEVELOPMENT OF LASERS AND REFLECTED WAVE TUBES WITH OVERLAPPING EFFECTIVE WAVE RANGE A67-17168
- SUBSYSTEM**
- LASER SYSTEM FOR DETERMINING SKY BACKSCATTERING RADIATION - SUBSYSTEM CIRCUIT DIAGRAMS NASA-CR-80441 N67-13120
- TRANSMIT BEAM OFFSET AND COARSE ACQUISITION SUBSYSTEMS FOR LASER/OPTICS TECHNIQUE BREADBOARD AND ACQUISITION AND TRACK SIMULATION NASA-CR-81701 N67-18023
- SULFUR**
- THRESHOLD STUDIES OF ION LASER OSCILLATIONS IN SULFUR AND SATURATION AND QUENCHING OF LASER INTENSITY A66-26209
- SUM**
- RUBY AND NEODYMIUM GLASS LASERS SUM FREQUENCY GENERATION USING NONLINEAR ELECTRO-OPTICAL KDP CRYSTAL A67-17754
- SUPERCONDUCTING MAGNET**
- TRAVELING WAVE MASER FOR RADIO ASTRONOMY INTERFEROMETER NOTING SUPERCONDUCTING MAGNET, DYNAMO AND CRYOSTAT A67-20115



## SUPERCONDUCTIVITY

SUPERCONDUCTOR SOLENOID APPLICATION TO LASER  
DEVICES AND DEVELOPMENT OF MAGNETIC PLASMA TRAPS  
FOR RESEARCH IN CONTROLLED THERMONUCLEAR REACTIONS  
A66-41743

## SUPERHETERODYNE RECEIVER

LASER DETECTION OF COHERENT LIGHT AND  
SUPERHETERODYNE AND NONLINEAR PARAMETRIC STUDIES  
IN OPTICAL SPECTRUM A66-27821

OPTICAL SUPERHETERODYNE RECEIVER  
NASA-CR-81659

N67-17982

## SUPERSONIC FLOW

PULSED NITROGEN LASER ACTION IN WIND TUNNEL-  
SIMULATED SUPERSONIC FLOW A66-29384

## SURFACE DIFFUSION EFFECT

LASER ACTION DELAY DUE TO PLASMA-TUBE-SURFACE  
DECOMPOSITION RESULTING FROM BOMBARDMENT BY NEON  
IONS A67-15110

DYNAMICS OF NARROWING EFFECT OF SURFACE AND  
SPATIAL DISPERSING AGENTS ON RADIATION LINE OF  
RUBY LASER WITH NONRESONANCE FEEDBACK

A67-18797

## SURFACE EROSION

HEATING AND SCATTERING OF PLASMA PRODUCED BY  
GIANT LASER PULSE FOCUSED ON SOLID TARGET  
A67-14194

## SURFACE FINISH

OPTICAL METHODS AND EQUIPMENT USED IN CHECKING  
SURFACE FINISH AND VOLUME AND SURFACE  
INHOMOGENEITIES OF ACTIVE MEDIA AND  
INTERFEROMETRIC MIRRORS OF LASERS  
A67-13143

## SURFACE GEOMETRY

LASER SYSTEM FOR MEASURING SURFACE CONTOURS IN  
LARGE STEERABLE ANTENNAS A66-34296

## SURFACE INTERACTION

PARTICLE EMISSION FROM SURFACE INTERACTING WITH  
LASER BEAM A67-12180

## SURFACE LAYER

SECOND HARMONIC GENERATION BY Q-SWITCHED LASER  
PULSE FROM SILICON AND GERMANIUM SURFACES  
A66-26150

## SURFACE PROPERTY

SURFACE EFFECT ON TEMPERATURE, I-V AND WATT-  
AMPERE CHARACTERISTICS OF P-N JUNCTION  
SEMICONDUCTOR INJECTION LASER DIODE AS COHERENT  
LIGHT SOURCE A67-10077

## SURFACE ROUGHNESS

OPTICAL SURFACE ROUGHNESS MEASUREMENT USING  
COHERENT RADIATION PRODUCED BY HELIUM-NEON LASER  
SIGMA-POLARIZED AT 6328 ANGSTROMS  
A67-10020

## SURFACE TEMPERATURE

SURFACE TEMPERATURE DETERMINATION PROCEDURE FOR  
LASER HEATED METALS BASED ON HEAT CONDUCTION  
EQUATIONS AND ION EMISSION FROM SURFACE  
A66-29035

ENERGIES OF IONS GENERATED FROM METAL SURFACE  
IRRADIATED BY SINGLE GIANT PULSE LASER  
A66-38412

## SWITCH

ELECTRO-OPTIC INTRA-CAVITY COLOR SWITCHING IN  
KRYPTON ION FABRY-PEROT LASER  
A67-17888

ENERGY-LOSING BLEACHING MECHANISM OF ORGANIC  
PHOTOTROPIC CRYSTALS USED FOR RUBY LASER  
SWITCHES

ATD-66-119 N67-10437

## SWITCHING

SOLID LASER RADIATION OPERATING IN Q-SWITCHED  
RESONATOR REGIME NOTING EFFECT OF FINITE RATE OF  
SWITCHING, FINITENESS OF RELAXATION TIME,

TRANSMISSION COEFFICIENT FACTOR, ETC

A66-37142

FARADAY EFFECT AS SWITCHING TECHNIQUE FOR HIGH  
POWER LASER OUTPUT N67-12651

## SWITCHING CIRCUIT

AVALANCHE TRANSISTOR PULSER DESIGNED TO DRIVE  
GA AS RADAR-LASER DIODE A67-12964

LASER DIGITAL DEVICES, DISCUSSING USE AS SWITCHING  
CIRCUIT IN DIGITAL COMPUTER A67-19088

SEMICONDUCTOR LASERS FOR DIGITAL COMPUTER CIRCUITS  
N67-13063

## SYNCHRONIZED OSCILLATOR

STABLE LIMITING CYCLES OF LASER RESULTING FROM  
MUTUAL SYNCHRONIZATION OF PHASE-SHIFTED  
OSCILLATION MODES A66-39653

## SYNCHROTRON RADIATION

NEGATIVE ABSORPTION IN COSMIC RADIO SOURCES OF  
SYNCHROTRON RADIATION A67-15200

## SYNTHESIS

SYNTHESIS OF MODEL COMPOUNDS AND INTRAMOLECULAR  
ENERGY TRANSFER FOR ORGANIC LASER MATERIALS, AND  
SENSITIVE RARE EARTH FLUORESCENCE IN ORGANIC  
SOLVENTS  
NASA-CR-81780 N67-18123

## SYSTEM STABILITY

TRANSIENTS AND STABILITY OF IDEALIZED TWO-LEVEL  
LASER SYSTEM, OBTAINING RATE EQUATION SOLUTION,  
NOTING CHARACTERIZATION BY RELAXATION TIMES  
A66-41034

## SYSTEMS ANALYSIS

SYSTEMS ANALYSES AND MODELS OF LASER TECHNIQUES  
DESIGNED TO DETECT INTERPLANETARY DUST IN  
ATMOSPHERE OF EARTH  
NASA-CR-80473 N67-13108

## SYSTEMS DESIGN

SYSTEM DESIGN ANALYSIS OF LASER METHODS OF DEEP  
SPACE COMMUNICATION, EXAMINING LOCAL HETERODYNE  
SYSTEM / LHS/, DIRECT DETECTION SYSTEM / DDS/ AND  
TRANSMITTED REFERENCE SYSTEM A66-35666

SYSTEM DESIGN ANALYSIS OF LASER METHODS OF DEEP  
SPACE COMMUNICATION, EXAMINING LOCAL HETERODYNE  
SYSTEM / LHS/, DIRECT DETECTION SYSTEM / DDS/ AND  
TRANSMITTED REFERENCE SYSTEM A67-17635

SYSTEMS DESIGN STUDY OF ADVANCED GEODETIC LASER  
SYSTEM

AFCL-66-731 N67-15088

## T

## TARGET

GATED LASER NIGHT-VIEWING SYSTEM, CALCULATING  
APPARENT ILLUMINANCE AS FUNCTION OF TARGET  
DISTANCE A66-36938

## TARGET PENETRATION

HYPERVELOCITY IMPACT TESTS ON ALUMINUM TARGET  
PLATES TO EVALUATE MICROMETEOROID IMPACT  
SENSORS - LASER SIMULATION STUDY  
NASA-CR-76102 N66-30173

PLASMA FORMED BY LASER PULSE ON TUNGSTEN TARGET,  
MEASURING RADIUS, TEMPERATURE AND RADIATIVE  
PROPERTIES, DEVELOPING MODEL A67-18149

## TARGET THICKNESS

OPTICAL RAY TRACING TO PREDICT FOCUSING  
CHARACTERISTICS OF LASER LIGHT IN REFRACTIVE  
TARGETS, CALCULATING HEATING EFFECTS IN TARGET,  
NOTING TARGET GEOMETRY, REFRACTIVE INDEX,  
THICKNESS OF SKIN LAYERS, ETC A66-25531

## TECHNOLOGY

AEROSPACE TECHNOLOGY RESEARCH IN U.S.S.R. -  
LASER ACTION BY SUPERCOOLED PLASMA, LITHIUM  
CRYSTAL GROWTH, METALLOSILOXANE POLYMER SYNTHESIS  
AND SPACE TECHNOLOGY CINEMATOGRAPHY  
N66-32699

## TELECOMMUNICATION

LASER LIGHT MODULATION BY POCKELS OR KERR EFFECT  
FOR APPLICATION TO TELECOMMUNICATIONS SYSTEM,  
EXAMINING ELECTRICAL BIREFRINGENCE MODULATION

A66-36262

## TELEMETRY

TOPOCENTRIC DISTANCE OF GEODETIC SATELLITE GEOS-  
A MEASURED BY LASER TELEMETRY FROM STATION

A66-30586

RESEARCH PROGRAMS ON HOLOGRAPHY, INFRARED LASER,  
DIGITAL FILTER, ANTENNA TRACKING ACCURACY, PCM  
TELEMETRY, OPTICAL TRACKING CONTROL SYSTEM  
NASA-TM-X-55504

N66-31154

## TELESCOPE

GAS LASER AND TELESCOPE TECHNIQUES FOR DEEP SPACE  
OPTICAL COMMUNICATION SYSTEM  
NASA-CR-77482

N66-35245

## TELEVISION EQUIPMENT

LASER TV SYSTEM OPERATION, PERFORMANCE  
CHARACTERISTICS AND APPLICATION

A66-37743

HORIZONTAL DEFLECTION IN TV DISPLAY PRODUCED BY  
BRAGG REFLECTION OF LASER LIGHT BY ULTRASONIC  
WAVES IN WATER

A66-42816

## TELEVISION RECEPTION

LASER ILLUMINATED ELECTRO-OPTICAL IMAGING NOTING  
ENERGY VARIATION PARAMETERS, EQUIPMENT USED AND  
RESULTS OBTAINED IN TV RECEPTION

A66-35531

## TELEVISION TRANSMISSION

SOLAR PUMPING AND MODULATION OF VARIOUS LASER  
MATERIALS FOR DEEP SPACE COMMUNICATION, NOTING TV  
PICTURE TRANSMISSION

A66-28971

VOICE COMMUNICATIONS SYSTEM USING GA AS ROOM-  
TEMPERATURE INJECTION LASER AND TV COMMUNICATIONS  
SYSTEM USING GA AS CRYSTALS AS MODULATORS FOR  
LASER BEAMS

A67-11786

## TELLURIUM

STIMULATED EMISSION FROM ELECTRON BEAM EXCITATION  
OF TELLURIUM AND PURE AND N-TYPE DOPED INDIUM  
ANTIMONIDE IN SEMICONDUCTOR LASERS

A66-26179

PARAMETRIC AMPLIFICATION OF FAR IR IN TE CRYSTAL  
PUMPED BY CARBON DIOXIDE LASER

A67-13572

EMISSION FROM TELLURIUM SINGLE CRYSTAL PUMPED BY  
TWO WAVES FROM CARBON DIOXIDE LASER

A67-14914

## TELLURIUM COMPOUND

SECOND HARMONIC GENERATED BY TRANSMITTING LASER  
RADIATION THROUGH TELLURIUM MONOCRYSTAL, WHILE  
FILTERING OUT FUNDAMENTAL FREQUENCY

A66-25437

LASING POTENTIALS OF COMPOUNDS PREPARED FROM  
ELEMENTS OF GROUP II AND GROUP IV IN PERIODIC  
TABLE

N67-16953

## TEMPERATURE CONTROL

RECIRCULATION OF LIQUID THROUGH CELL AND EXTERNAL  
HEAT EXCHANGER TO SOLVE PROBLEM OF REPEATED  
FLASHING IN EUROPIUM CHELATE LASERS

A66-39108

## TEMPERATURE DISTRIBUTION

TEMPERATURE DISTRIBUTION IN TWO-LAYER PLATE DURING  
WELDING BY LASER LIGHT FLUX

A66-40194

TEMPERATURE DISTRIBUTION IN BILAYER SHEET DURING  
WELDING WITH LASER BEAM  
JPRS-37856

N66-39411

TEMPERATURE DISTRIBUTION IN TWO-LAYER PLATE  
DURING WELDING BY LASER LIGHT FLUX

A67-17548

## TEMPERATURE EFFECT

ABSORPTION BEHAVIOR OF OPTICALLY PUMPED RUBY ROD,

NOTING AMPLIFICATION AT ROOM TEMPERATURE AND  
ABSORPTION AT CRYOGENIC TEMPERATURE

A66-26174

TEMPERATURE SHIFT OF RUBY LASER EMISSION MEASURED  
INTERFEROMETRICALLY FOR TEMPERATURES BETWEEN 66  
AND 210 DEGREES K

A66-28701

PARAMAGNETIC RESONANCE SPECTRA SHIFT DUE TO  
TEMPERATURE CHANGE IN CROSS-RELAXATION RUTILE  
MASER

A66-30820

EFFECTS AND PARAMETERS INFLUENCING OPTICAL PATH  
LENGTH WITHIN PUMPING PROCESS IN RUBY AND DOPED  
GLASS LASER RODS

A66-31443

DISINTEGRATION OF ALKALI HALIDE SINGLE CRYSTALS,  
POLYMERS AND GLASSES UNDER LASER RADIATION, NOTING  
PARAMETERS OF DISINTEGRATION REGION MAGNITUDE

A66-34681

NE- HE LASER OUTPUT DEPENDENCE ON PRESSURE AND  
NONEXCITED ATOM CONCENTRATION

A66-34696

PULSED LASER ACTION IN VISIBLE SPECTRUM OF SINGLY  
IONIZED GE, SN, PB, IN, CD AND ZN, LISTING  
TEMPERATURE AND PRESSURE RANGES

A66-36076

PHOTODISSOCIATION LASER SYSTEM, DISCUSSING OUTPUT  
ENERGY DEPENDENCE ON PRESSURE, TEMPERATURE AND  
NUMBER OF SUCCESSIVE OPTICAL PUMPING FLASHES

A66-37781

INTERCHANNEL GENERATION TRANSFER AND MULTICHANNEL  
GENERATION IN LASER WITH FOUR UNSPLIT LEVELS,  
NOTING RADIATION DENSITY, TEMPERATURE EFFECT AND  
VARIATIONS IN COEFFICIENTS OF LOSSES

A66-38956

CRYSTAL DEFECTS AND PERFORMANCE IN RUBY LASER,  
MEASURING COHERENCE FUNCTION OF LIGHT AND OUTPUT  
ENERGY AND CRYSTAL HOMOGENEITY

A66-41291

GA AS SEMICONDUCTOR QUANTUM GENERATOR HEATING  
DURING INJECTION PULSE, ANALYZING TEMPERATURE  
EFFECT ON EXTERNAL QUANTUM OUTPUT AND GENERATOR  
EFFICIENCY

A66-41621

FREQUENCY TEMPERATURE DEPENDENCE OF LONGITUDINAL  
AND TRANSVERSE HYPERSONIC WAVE ABSORPTION  
COEFFICIENTS IN QUARTZ AND ARTIFICIAL RUBY CRYSTAL

A66-42514

NE- HE LASER OUTPUT DEPENDENCE ON PRESSURE AND  
NONEXCITED ATOM CONCENTRATION

A67-10512

TEMPERATURE DEPENDENCE OF THRESHOLD FOR STIMULATED  
EMISSION OF NO TRIVALENT ION IN SEVERAL HOST  
LATTICES ESTIMATED FROM INTENSITY VARIATION OF  
LASER ACTIVE FLUORESCENCE COMPONENT

A67-11085

DISINTEGRATION OF ALKALI HALIDE SINGLE CRYSTALS,  
POLYMERS AND GLASSES UNDER LASER RADIATION, NOTING  
PARAMETERS OF DISINTEGRATION REGION MAGNITUDE

A67-14367

TRIVALENT NEODYMIUM DOPED GLASS LASER WITH  
INTERNAL IMPERFECTIONS DUE TO OPTICAL PUMPING  
EXAMINED VIA OPTICAL METALLOGRAPHY, TRANSMISSION  
ELECTRON MICROSCOPY AND ELECTRON DIFFRACTION  
TECHNIQUES

A67-14927

INTERCHANNEL GENERATION TRANSFER AND MULTICHANNEL  
GENERATION IN LASER WITH FOUR UNSPLIT LEVELS,  
NOTING RADIATION DENSITY, TEMPERATURE EFFECT AND  
VARIATIONS IN COEFFICIENTS OF LOSSES

A67-15760

TEMPERATURE DEPENDENCE OF THRESHOLD CURRENT IN  
INJECTION LASERS IN CONTINUOUS OPERATION UNDER  
LIQUID NITROGEN COOLING

A67-18788

TEMPERATURE DEPENDENCE OF PARAMAGNETIC RESONANCE  
SPECTRAL SHIFTS IN CHROMIUM-DOPED TITANIUM OXIDE  
CRYSTAL OF CROSS RELAXATION RUTILE MASER

A67-19676

- TEMPERATURE DEPENDENCE OF FLUORESCENT FREQUENCY  
SHIFT IN RUBY LASER  
FTD-TT-65-2006 A66-10978
- TEMPERATURE FIELD  
TEMPERATURE FIELD OF ACTIVE MEDIUM OF PULSED LASER  
USING VARIATIONAL METHODS, CONSIDERING TWO  
APPROXIMATE SOLUTIONS A67-16935
- TEMPERATURE GRADIENT  
FABRY-PEROT ETALON USE FOR INTERFEROMETRY AND  
LASER CONTROL, NOTING LOW ANGLE SCATTERING, LASER  
OSCILLATION, THERMAL TUNING SENSITIVITY, ETC A66-32619
- GAS LENS FOCUSING OF LIGHT BEAMS, USING HIGHLY  
TRANSPARENT GAS WITH WEAKLY VARYING REFRACTIVE  
INDEX TO GUIDE COHERENT TRANSMISSION WITH SMALL  
LOSSES A67-19789
- TEMPERATURE MEASUREMENT  
TEMPERATURES, LORENTZIAN WIDTHS AND DRIFT  
VELOCITIES OF EXCITED NEUTRAL AND IONIC SPECIES IN  
ARGON-ION LASER, NOTING THERMAL EQUILIBRIUM  
ACHIEVEMENT A66-28695
- TENSILE TESTING MACHINE  
EXTENSOMETER FOR MEASURING SMALL CHANGES OF  
SPECIMEN ON TENSILE TESTING VACUUM FURNACE AT  
HIGH TEMPERATURES, USING CW GAS LASER AS LIGHT  
SOURCE A67-11036
- LASER EXTENSOMETER MEASURING SMALL DIMENSIONAL  
CHANGES OF SPECIMEN IN TENSILE TESTING FURNACE AT  
HIGH TEMPERATURES A67-18778
- TEST METHOD  
INTERFERENTIAL METHOD OF TESTING HIGH RESOLUTION  
PHOTOGRAPHIC EMULSIONS, USING LASER AS LIGHT  
SOURCE A67-10832
- THERAPY  
TISSUE DESTRUCTION BY LASER RADIATION, ITS  
MANAGEMENT AND PREVENTIVE MEASURES A66-81926
- PARTIAL INHIBITION OF LASER REACTION IN MAN BY  
TOPICAL CORTICOSTEROIDS A67-80434
- THERMAL DECOMPOSITION  
CHEMICAL PUMPED UV LASER ACTION THROUGH THERMAL  
DECOMPOSITION OF DIMETHYL PEROXIDE A66-28836
- THERMAL DEGRADATION  
SURFACE ASPECTS OF THERMAL DEGRADATION OF GaAs  
P-N JUNCTION LASERS AND TUNNEL DIODES A67-15620
- THERMAL DIFFUSION  
RUBY LASER AS ENERGY SOURCE FOR MEASURING  
THERMOPHYSICAL PROPERTIES OF MATERIALS VIA FLASH  
TECHNIQUE A67-15305
- THERMAL EFFECT  
THERMALLY-INDUCED OPTICAL PATH DISTORTIONS IN  
LASER RODS MEASURED BY OBTAINING TIME RESOLVED  
INTERFEROGRAMS, USING MACH-ZEHNDER  
INTERFEROMETER AND Q-SWITCHED LASER A66-25994
- THERMAL OPTICAL BEHAVIOR OF GLASSES AND OTHER  
POTENTIAL LASER MATERIALS AND THERMAL DISTORTION  
IN AIR, WATER, BENZINE, ETHANOL AND TOLUENE A66-25996
- AMPLIFICATION OF INTERACTION OF ATOMS AND OF  
PULSED OR PERIODIC COOLING OF TRANSPARENT MEDIA  
PRODUCED BY LASER BEAM, NOTING CHANGES IN KINETIC  
ENERGY OF ATOMS A66-26021
- THERMAL EFFECTS IN VARIOUS MEDIA DUE TO LASER BEAM  
A66-29209
- THERMAL EFFECTS IN VARIOUS MEDIA DUE TO LASER BEAM  
A66-33058
- CW RUBY LASER OF 10-MM LENGTH IN ELLIPSOIDAL  
PUMPING SYSTEM UNDER WATER COOLING, NOTING VARIOUS
- MODES A66-40100
- MODE SELECTION, RELAXATION OSCILLATIONS, MODE  
INTERACTION AND THERMAL EFFECTS IN ROOM  
TEMPERATURE CW LASERS IN ELLIPSOIDAL PUMPING  
SYSTEMS A66-42546
- LASER BRIGHTNESS GAIN AND SINGLE TRANSVERSE MODE  
OPERATION BY COMPENSATION FOR THERMAL DISTORTION  
WITH EXTERNAL MIRROR A67-16656
- THERMAL ENERGY  
HIGH FREQUENCY-STABILITY EM WAVE SOURCE, APPLYING  
THERMAL EXCITATION METHODS TO PENCIL QUANTUM  
GENERATOR IN IR REGION A66-39336
- HIGH FREQUENCY-STABILITY EM WAVE SOURCE, APPLYING  
THERMAL EXCITATION METHODS TO PENCIL QUANTUM  
GENERATOR IN IR REGION A66-39706
- THERMAL EXPANSION  
THERMALLY INDUCED EFFECTS ON RUBY AND NEODYMIUM  
IN GLASS LASER RODS  
AFCRL-66-57 N66-26341
- THERMAL NOISE  
FOKKER-PLANCK EQUATION APPLIED TO LASER UNDER  
INFLUENCE OF QUANTUM FLUCTUATIONS CONNECTED WITH  
DISSIPATION, PUMPING AND CAVITY THERMAL NOISE,  
NOTING DISTRIBUTION AND CORRELATION FUNCTION A66-38930
- LOW NOISE RECEIVERS - TRAVELING WAVE MASER  
DEVELOPMENT N67-15913
- THERMAL PLASMA  
THERMALIZATION RATE OF HIGHLY IONIZED PLASMA WITH  
INITIALLY HOT IONS AND COLD ELECTRONS, USING LASER  
SCATTERING TO OBSERVE TIME VARIATION OF ELECTRON  
TEMPERATURE A67-10912
- THERMAL RADIATION  
ABSOLUTE FLUX MEASUREMENT FOR PULSED AND TRIGGERED  
LASERS REQUIRING ONLY QUANTUM RECEIVERS A66-26375
- DYNAMIC OPTICAL PATH DISTORTION IN RUBY AND  
NEODYMIUM DOPED GLASS LASER RODS DUE TO  
EVOLUTION OF THERMAL GRADIENTS DURING OPTICAL  
PUMPING CYCLE N66-28554
- THERMALLY EXCITED INFRARED BEAM LASER USING  
CARBON DIOXIDE, NITROGEN OXIDE, AND HYDROCYANIC  
ACID MOLECULAR ENERGY LEVELS  
ATD-66-102 N67-15769
- THERMOCONDUCTIVITY  
SURFACE TEMPERATURE DETERMINATION PROCEDURE FOR  
LASER HEATED METALS BASED ON HEAT CONDUCTION  
EQUATIONS AND ION EMISSION FROM SURFACE A66-29035
- THERMODYNAMICS  
INFORMATION THEORY AND THERMODYNAMICS OF MASERS  
FTD-TT-65-899/1628364 N66-29196
- INJECTION LASER COOLING BY REMOVAL OF HEAT FROM  
ENVIRONMENT FOR CONVERSION TO LIGHT  
NASA-CR-76761 N66-32437
- THERMOELASTICITY  
THERMOELASTIC WAVE EQUATIONS IN CONTINUUM  
MECHANICS MODEL OF LASER-INDUCED FRACTURE IN  
TRANSPARENT MEDIA IN TERMS OF LASER BEAM ENERGY  
ABSORPTION A66-40089
- THERMOELECTRICITY  
LOCAL LASER HEATING OF CATHODE FOR ELECTRON  
EXTRACTION FROM PLASMOID A66-29879
- THERMONUCLEAR ENERGY  
CONTROLLED THERMONUCLEAR STUDIES - CAULKED STUFFED  
CUSP MINIMUM-B MACHINE, SCYLLA OPERATION AND  
MEASUREMENTS, RUBY LASER TESTING, PLASMA GUNS,  
AND ELECTRIC AND MAGNETIC FIELD MEASUREMENTS  
LA-3434-MS N66-25226
- THERMONUCLEAR REACTION  
SUPERCONDUCTOR SOLENOID APPLICATION TO LASER

- DEVICES AND DEVELOPMENT OF MAGNETIC PLASMA TRAPS  
FOR RESEARCH IN CONTROLLED THERMONUCLEAR REACTIONS  
A66-41743
- THERMOPHYSICAL PROPERTY**  
RUBY LASER AS ENERGY SOURCE FOR MEASURING  
THERMOPHYSICAL PROPERTIES OF MATERIALS VIA FLASH  
TECHNIQUE A67-15305
- THERMOSTABILITY**  
TEMPERATURES, LORENTZIAN WIDTHS AND DRIFT  
VELOCITIES OF EXCITED NEUTRAL AND IONIC SPECIES IN  
ARGON-ION LASER, NOTING THERMAL EQUILIBRIUM  
ACHIEVEMENT A66-28695
- HEAT TRANSFER AND STRESS WAVE EVOLUTION PRIOR TO  
ABLATION AND THERMAL EQUILIBRIUM IN EXPOSURE OF  
SOLID AND LIQUID MATERIALS TO LASER SOURCES  
A66-32638
- THETA PINCH**  
LASER PUMPING BY INTENSE NOBLE GAS DISCHARGE IN  
ZETA-PINCH GEOMETRY A66-25995
- IMPLOSION OF FAST NONPREIONIZED THETA PINCH  
STUDIED, USING FIRST AND SECOND HARMONIC OF RUBY  
LASER LIGHT A66-37638
- C W ARGON ION LASER SCATTERING IN ARGON PLASMA,  
NOTING RESONANCE AND CORRELATION BETWEEN DATA AND  
PLASMA PROPERTIES A67-16665
- FARADAY ROTATION MEASUREMENT OF TRAPPED MAGNETIC  
FIELDS IN THETA PINCH PLASMA, USING GAS LASER BEAM  
A67-17447
- THIN FILM**  
MAGNETIC DOMAIN PATTERNS IN THIN FERROMAGNETIC  
FILMS USING 10 MILLIWATT HELIUM-NEON LASER  
N66-30158
- RUBY LASER USED IN VAPOR DEPOSITION OF THIN METAL  
FILMS  
UD-2037-E-1 N66-32219
- LASER DAMAGE OF THIN FILMS - ENERGY DENSITY  
THRESHOLDS DETERMINED FOR SINGLE QUARTERWAVE AND  
HALFWAVE FILMS VACUUM EVAPORATED ON GLASS AND  
QUARTZ SUBSTRATES  
AD-633554 N66-34015
- CONTINUOUSLY VARIABLE OPTICAL DELAY LINE USING  
ACOUSTIC WAVES TO DIFFRACT AND FREQUENCY SHIFT  
PORTION OF ARGON ION LASER BEAM  
A67-12517
- LASER BEAM-INDUCED RECRYSTALLIZATION OF AMORPHOUS  
GE SEMICONDUCTOR THIN FILMS PREPARED BY THERMAL  
DEPOSITION ON GLASS A67-13839
- VAPORIZATION OF THIN METALLIC FILMS WITH FOCUSED  
LASER BEAM, COMPARING THEORETICAL AND EXPERIMENTAL  
RESULTS PREPARED BY USING PULSED HIGH PRESSURE  
HELIUM-NEON LASER A67-15478
- CHANGES IN GIANT MOLECULE STRUCTURE OF  
POLYPROPYLENE FILMS UNDER ACTION OF LASER PULSES  
ANALYZED BY OPTICAL MICROSCOPY A67-19169
- THOMSON EFFECT**  
RADIATIVE CORRECTIONS TO THOMSON SCATTERING IN  
LASER BEAMS ARISING FROM DAMPING OF ELECTRON  
MOTION AND PHOTON DENSITY, USING QUANTUM MECHANICS  
A66-30628
- LASER MODE OPERATION IN PRESSURE OF RADIATION  
ABSORBING IMPURITY ANALYZED BY EXTENDED THOMSON  
TYPE SYSTEM A66-31558
- LASERS USED TO EXTEND RF PLASMA DIAGNOSTIC  
PROCEDURES TO OPTICAL FREQUENCIES BY  
INTERFEROMETRIC AND THOMSON DIFFUSION METHODS  
A67-13474
- THRESHOLD**  
THRESHOLD DATA FOR RUBY AND NEODYMIUM LASER  
PULSE-INDUCED BREAKDOWN IN Xe, Ar, Kr, Ne,  
He, OXYGEN, NITROGEN, AIR AND CARBON DIOXIDE  
A66-26191
- THRESHOLD DETERMINATION OF PULSED RUBY LASER BY  
SINGLE PULSE TECHNIQUE A66-37548
- EFFECT OF POWER AND PATH LENGTH ON THRESHOLD FOR  
STIMULATED RAMAN SPECTRA N66-35535
- FEASIBILITY OF USING FLUORESCING DYES PUMPED WITH  
RUBY LASER FOR LOWER THRESHOLDS THAN RAMAN TYPE  
LASERS  
AD-636953 N66-38187
- THRESHOLD CURRENT**  
GALLIUM ARSENIDE P-N JUNCTION LASER DIODE,  
INJECTION CURRENT DISTRIBUTION, DENSITY AND  
EMISSION SPECTRA VARIATION A66-25934
- KINETIC THEORY OF SEMICONDUCTOR LASER WITH P-N  
STEP JUNCTION A66-33126
- GAIN FACTOR VARIATION WITH THRESHOLD CURRENT IN  
REFLECTIVE AND ANTIREFLECTIVE FILMS OF Ga As  
LASER WITH PHOTON AND CURRENT DENSITIES  
A66-38388
- THRESHOLD CURRENT DENSITY DEPENDENCY ON PHOTON  
ENERGY IN GALLIUM ARSENIDE LASER DIODES  
A67-13480
- HIGH MAGNETIC FIELD EFFECT ON INTERBAND  
SEMICONDUCTOR LASER, PARTICULARLY ELECTROMAGNETIC  
MODES AND COUPLING AND THRESHOLD CURRENT  
CONDITIONS A67-16673
- TEMPERATURE DEPENDENCE OF THRESHOLD CURRENT IN  
INJECTION LASERS IN CONTINUOUS OPERATION UNDER  
LIQUID NITROGEN COOLING A67-18788
- THRESHOLD SHIFT**  
LENGTH DEPENDENT THRESHOLD DATA FOR STIMULATED  
RAMAN EMISSION IN LIQUIDS, NOTING CORRELATION  
BETWEEN LASER BEAM SELF-FOCUSING AND ONSET OF  
RAMAN EMISSION A66-30157
- TIME CONSTANT**  
ONSET OF OSCILLATION IN He-Ne LASER ANALYZED  
USING LAMB THEORY, OBTAINING TIME CONSTANT VALUE  
FOR POPULATION OF LOWER LASER LEVEL  
A67-16821
- TIME DELAY**  
SPATIAL SELECTIVE FADING AS RANDOM PROCESS,  
DISCUSSING SPATIAL COHERENCE, WAVE NUMBER  
DISPERSION PROFILE, TIME DELAY PROFILE, ETC., IN  
IONOSPHERIC PROPAGATION A66-26859
- CURRENT INJECTION EFFECT ON TIME DELAY OF Ga As  
LASER RADIATION A67-10083
- ENHANCED LASING OF HIGH PRESSURE He-Ne LASER,  
COMMENTING ON DELAY TIME OF LIGHT PULSE EMITTING  
THROUGH WALLS OF DISCHARGE TUBE FROM START OF  
EXCITING PULSE A67-16687
- TIME BEHAVIOR OF PULSED WATER VAPOR LASER, NOTING  
SPIKING FROM FAR IR EMISSION LINES  
A67-20095
- TIME DEPENDENCY**  
ATOMIC MASER CLOCKS ROTATION WITH EARTH, DERIVING  
FORMULA FOR RELATIVE DRIFT AT WIDELY SEPARATED  
LOCALITIES ARISING FROM LOCAL GRAVITATIONAL  
POTENTIALS A66-30187
- TIME DEPENDENT SCHROEDINGER EQUATION FOR BLOCH  
ELECTRON IN PRESENCE OF LASER FIELD, USING WKB  
APPROXIMATION METHOD, COMPARED WITH PERTURBATION  
THEORY A66-41266
- TIME DEPENDENCY OF PHASE DIFFERENCE OF TWO  
WEAKLY COUPLED NONLINEAR OPTICAL OSCILLATORS,  
CONSIDERING COUPLING OF TWO TRAVELING WAVES IN  
LASER A66-42257
- TIME EVOLUTION OF LASER INDUCED FRACTURES IN  
GLASS, NOTING CRACK PROPAGATION ACCOMPANIED BY  
SPARKING A67-12508
- C W ARGON ION LASER SCATTERING IN ARGON PLASMA,  
NOTING RESONANCE AND CORRELATION BETWEEN DATA AND

- PLASMA PROPERTIES A67-16665
- TIME FACTOR  
THERMALIZATION RATE OF HIGHLY IONIZED PLASMA WITH INITIALLY HOT IONS AND COLD ELECTRONS, USING LASER SCATTERING TO OBSERVE TIME VARIATION OF ELECTRON TEMPERATURE A67-10912
- TIME RESPONSE  
CRYSTAL MOTION EFFECT ON TIME BEHAVIOR OF LASER GENERATION MODE, USING HIGH SPEED PHOTOGRAPHY AND OSCILLOGRAMS A66-29725
- TIME VARIATION IN INTENSITY OF LIGHT EMITTED FROM CW GA AS LASER DIODES A67-10243
- TIN COMPOUND  
STIMULATED RAMAN EFFECT IN LIQUID STANNIC CHLORIDE AND METHANE GAS USING MEDIUM POWER RUBY LASER N66-35532
- TISSUE  
TISSUE DESTRUCTION BY LASER RADIATION, ITS MANAGEMENT AND PREVENTIVE MEASURES A66-81926
- TITANIUM OXIDE  
FERRIC-DOPED-RUTILE 8 MM TRAVELING WAVE MASER, NOTING OPERATING RANGE AND PERFORMANCE CHARACTERISTICS A67-13986
- TEMPERATURE DEPENDENCE OF PARAMAGNETIC RESONANCE SPECTRAL SHIFTS IN CHROMIUM-DOPED TITANIUM OXIDE CRYSTAL OF CROSS RELAXATION RUTILE MASER A67-19676
- TOOLING  
LASER SYSTEM FOR DIAMOND PIERCING IN WIRE-DRAWING DIES AND CLOSED CIRCUIT TV VIEWING SYSTEM FOR MONITORING OPERATION A67-15309
- TOROIDAL DISCHARGE  
PULSED TOROIDAL EXCITATION OF GAS ION LASERS EXTENDED TO DRIVE HIGH POWER CW LASER TRANSITIONS IN AR, KR, CL AND BR, NOTING OPERATING PARAMETERS AND POWER OUTPUT A66-28877
- TRACKING  
LASER TECHNOLOGY AND APPLICATION ESPECIALLY IN OPTICAL RADAR AND SPACE TRACKING ON EXPLORER SATELLITES  
NASA FACTS, VOL. III, NO. 6 N66-31850
- TRACKING ANTENNA  
RESEARCH PROGRAMS ON HOLOGRAPHY, INFRARED LASER, DIGITAL FILTER, ANTENNA TRACKING ACCURACY, PCM TELEMETRY, OPTICAL TRACKING CONTROL SYSTEM  
NASA-TM-X-55504 N66-31154
- TRACKING SYSTEM  
SENSITIVITY AND TRACKING CAPABILITIES OF PRECISION LASER AUTOMATIC TRACKING SYSTEM A66-25984
- PRECISION AUTOMATIC TRACKING USING CW HE- NE LASER, NOTING PERFORMANCE AND APPLICATION A66-28448
- NITROGEN-CARBON DIOXIDE 10.6 MICRON LASER FOR OPTICAL TRACKING SYSTEM N66-31161
- DESIGN AND PERFORMANCE OF CW GAS LASER TRACKER N66-36554
- HYDROGEN MASER POTENTIAL AS STABLE FREQUENCY REFERENCE FOR PRECISION TRACKING SYSTEMS N67-16725
- TRAINING EQUIPMENT  
AIRBORNE LASER DRIVEN WEAPON SIMULATOR NAVTRADEVCE-1867-1 N66-35051
- TRANSDUCER  
LASER MIRROR TRANSDUCER DECOUPLING FROM MECHANICAL RESONANCES OF LASER CAVITY A66-35813
- TRANSFER FUNCTION  
MEASUREMENT AND THEORY, INCLUDING SIGNAL TO NOISE AND TRANSFER FUNCTION CALCULATIONS, OF
- ATMOSPHERIC WATER VAPOR USING RUBY LASER OPTICAL RADAR N67-13488
- TRANSFORMER  
CURRENT MEASURING DEVICE FOR EHV TRANSMISSION LINE, OBTAINING INSTANTANEOUS MAGNETIC FIELD BY GAUGING FARADAY ROTATION ANGLE OF LASER BEAM IN FLINT GLASS ROD A66-42556
- MERCURY WETTED RELAY PULSE GENERATOR AND PULSE TRANSFORMER TO DRIVE GALLIUM ARSENIDE LASERS IN FAST PULSE MODE  
HDL-TM-66-3 N66-34246
- TRANSIENT RESPONSE  
LASER AMPLIFIER THEORY USING FABRY-PEROT INTERFEROMETER AND LAPLACE TRANSFORM FOR OBTAINING TRANSIENT SOLUTIONS IN ADDITION TO STEADY STATE SOLUTIONS A66-39224
- QUENCHING OF ONE PULSED RUBY LASER OSCILLATION BY ANOTHER, NOTING COUPLED RATE EQUATIONS FOR STEADY STATE AND TRANSIENT BEHAVIOR A67-16682
- TRANSIENT BEHAVIOR OF HE- NE LASERS UNDER PULSED HF EXCITATION, DISCUSSING RATE EQUATIONS REPRESENTING ATOMIC POPULATION DENSITY AND PHOTON DENSITY A67-16980
- TRANSISTOR  
AVALANCHE TRANSISTOR GENERATION OF JITTER-FREE NANOSECOND CURRENT PULSES FOR DRIVING GA AS LASER DIODES AT LOW TEMPERATURES A66-37453
- AVALANCHE TRANSISTOR PULSER DESIGNED TO DRIVE GA AS RADAR-LASER DIODE A67-12964
- TRANSISTOR AMPLIFIER  
OPTICAL MODULATOR USING ELECTRO-OPTIC EFFECT IN LITHIUM TANTALATE FOR PCM TRANSMISSION SYSTEMS OPERATING AT 224 MEGACYCLE BIT RATE A67-10013
- TRANSITION ELEMENT  
FLUORESCENCE OF RARE EARTH, ACTINIDE AND TRANSITION METAL IONS IN INSULATING CRYSTALS AS RESULT OF OPTICAL EXCITATION, DISCUSSING SPECTROSCOPIC PROPERTIES AND OPERATING CHARACTERISTICS A66-36969
- HYPERFINE SPECTRUM OF XENON IN 3.5 MM MASER TRANSITION NOTING EXPERIMENTAL SETUP, GAIN PROFILES FOR VARIOUS INPUT POWER LEVELS AND STRUCTURAL PROPERTIES A66-38763
- FREQUENCY TUNING OF COHERENT EMISSION OVER VIBRONIC CONTINUUM OF PHONON-TERMINATED OPTICAL MASERS BY THERMAL TUNING AND WAVELENGTH-SELECTIVE FEEDBACK A66-41369
- CRYSTALLINE SOLID LASERS, CONSIDERING RARE EARTH AND TRANSITION METAL IMPURITIES AND HOST MATERIALS, NOTING CW LASER CHARACTERISTICS A66-42799
- ORGANIC SENSITIZERS FOR EVALUATION OF TRANSITION METAL FLUORESCENCE IN OPTICAL LASER APPLICATION  
NASA-CR-77913 N66-36265
- TRANSITION LAYER  
UPPER LASER STATES DERIVING POPULATION THROUGH CASCADE TRANSITIONS FROM HIGHER LAYER STATES OF ARGON ION NOTING CONSISTENCY OF LASER OUTPUT CURRENT DEPENDENCE WITH CURRENT DEPENDENCE OF CASCADE RATE A66-37774
- TRANSITION POINT  
CONTINUOUS WAVE UV IONIZED GAS LASER EMISSION OVER FOUR TRANSITIONS IN NEON, KRYPTON AND ARGON A66-37771
- TRANSITIONS OF FIRST TWO BAND SYSTEMS OF IODINE EXCITED IN ARGON SUITABLE FOR LASER ACTION A66-42085
- TRANSITION PROBABILITY  
TRANSITION PROBABILITIES AND LIFETIMES IN IONIZED ARGON GAS LASERS A66-26207

MOLECULE REORIENTATION AND TRANSITION PROBABILITY  
IN MOLECULAR BEAM MASER USING FORMALDEHYDE  
A66-39662

RADIATIVE TRANSITION PROBABILITIES BETWEEN LASER  
VIBRATIONAL LEVELS OF CARBON DIOXIDE, NOTING  
RELAXATION TIME AND DIPOLE MOMENT  
A67-11891

SATURABLE OPTICAL ABSORPTION OF LIGHT FLUX FROM  
HIGH INTENSITY Q-SWITCHED RUBY LASER  
A67-16677

GASEOUS LASER OUTPUT EXPRESSED IN SINGLE OR TWO-  
LINE OSCILLATIONS AS FUNCTION OF PUMPING RATES AND  
TRANSITION PROBABILITIES, CONSIDERING CONCEPT OF  
EQUIVALENT NETWORK  
A67-16979

**TRANSMISSION**  
OPTICAL PROPERTIES OF CRYPTOCYANINE NOTING  
TRANSIENT DECAY OF FLUORESCENCE, USING RUBY LASER  
AND TRANSMISSION OF METHANOL SOLUTION  
A66-40103

ATMOSPHERIC HEATING BY LASER PULSES IN  
TRANSMISSION WINDOWS  
TRW-4535-6003-RD-000  
N66-34232

**TRANSMISSION EFFICIENCY**  
SOLID LASER RADIATION OPERATING IN Q-SWITCHED  
RESONATOR REGIME NOTING EFFECT OF FINITE RATE OF  
SWITCHING, FINITENESS OF RELAXATION TIME,  
TRANSMISSION COEFFICIENT FACTOR, ETC  
A66-37142

**TRANSMISSION LINE**  
PULSED COAXIAL TRANSMISSION LINE NITROGEN GAS  
LASER, NOTING PRESSURE EFFECT  
A66-40107

**TRANSMISSION LOSS**  
TROPOSPHERIC PROPAGATION USING LASER AS  
TRANSMITTER, ANALYZING EFFECTS OF BENARD CELLS,  
TURBULENCE, WIND SHEAR, ETC  
A66-42367

**TRANSPARENT MATERIAL**  
STATISTICAL EFFECTS DURING GENERATION OF SECOND  
HARMONIC IN OPTICALLY TRANSPARENT CRYSTALS, NOTING  
COEFFICIENT OF CORRELATION BETWEEN HARMONIC AND  
FUNDAMENTAL RADIATION POWER OF SOLID STATE LASER  
A66-31167

THERMOELASTIC WAVE EQUATIONS IN CONTINUUM  
MECHANICS MODEL OF LASER-INDUCED FRACTURE IN  
TRANSPARENT MEDIA IN TERMS OF LASER BEAM ENERGY  
ABSORPTION  
A66-40089

STATISTICAL EFFECTS DURING GENERATION OF SECOND  
HARMONIC IN OPTICALLY TRANSPARENT CRYSTALS, NOTING  
COEFFICIENT OF CORRELATION BETWEEN HARMONIC AND  
FUNDAMENTAL RADIATION POWER OF SOLID STATE LASER  
A67-12928

**TRANSVERSE OSCILLATION**  
EXPERIMENTAL OBSERVATION OF REGULAR SPIKING IN  
NEODYMIUM DOPED GLASS LASER ROD ATTRIBUTED TO  
SIMULTANEOUS OSCILLATION OF MANY TRANSVERSE AND  
LONGITUDINAL MODES  
A66-28727

**TRAPPED MAGNETIC FIELD**  
FARADAY ROTATION MEASUREMENT OF TRAPPED MAGNETIC  
FIELDS IN THETA PINCH PLASMA, USING GAS LASER BEAM  
A67-17447

**TRAPPED RADIATION**  
PUMPING ENERGY DISTRIBUTION OF RUBY LASER,  
DISCUSSING EXISTENCE OF TRAPPED MODES AND EFFECT  
OF PARTIALLY FILLED WATER JACKET SURROUNDING RUBY  
RODS  
A66-35389

SELF-TRAPPING OF LASER BEAM DUE TO DIFFRACTION  
FROM DIELECTRIC WAVEGUIDE ARISING FROM  
PERMITTIVITY INCREASE OF BIREFRINGENT BEAM  
A66-42554

PROPERTIES OF SELF-TRAPPED LIGHT FILAMENTS NOTING  
STIMULATED RAMAN EMISSION AND CREATION,  
CONTAINMENT AND TERMINATION MECHANISMS  
A67-16648

**TRAVELING WAVE**

TRAVELING WAVE BEATS CREATED BY RING LASER ON  
ROTATING PLATFORM, NOTING FREQUENCY DIVISION  
ROTATING RATE AND CAPTURE BAND PARAMETERS  
A66-25102

TRAVELING WAVE BEATS CREATED BY RING LASER ON  
ROTATING PLATFORM, NOTING FREQUENCY DIVISION  
ROTATING RATE AND CAPTURE BAND PARAMETERS  
A66-30281

TRAVELING WAVES INTERACTION IN GAS LASER,  
EXPLAINING FORCING-OF-OSCILLATIONS AND TRAVELING  
WAVE SUPPRESSION EFFECT  
A66-34685

COUPLING BETWEEN OPPOSITELY DIRECTED TRAVELING  
WAVES IN HE-NE RING LASER IN FORM OF MUTUAL  
BACKSCATTERING OF ENERGY FROM EACH BEAM INTO  
DIRECTION OF OTHER  
A66-37778

TIME DEPENDENCY OF PHASE DIFFERENCE OF TWO  
WEAKLY COUPLED NONLINEAR OPTICAL OSCILLATORS,  
CONSIDERING COUPLING OF TWO TRAVELING WAVES IN  
LASER  
A66-42257

GENERATING MODE NUMBER IN SOLID STATE LASERS USING  
TRAVELING WAVE AND STANDING WAVE  
A67-10069

OSCILLATION FREQUENCY OF MASER OSCILLATOR  
CALCULATED USING PERTURBATION THEORY, NOTING  
TRAVELING WAVE EFFECT  
A67-10395

TRAVELING WAVES INTERACTION IN GAS LASER,  
EXPLAINING FORCING-OF-OSCILLATIONS AND TRAVELING  
WAVE SUPPRESSION EFFECT  
A67-14371

TRAVELING WAVE RUBY LASER AS RADAR TRANSMITTER  
NOTING POWER GAIN, COHERENCE, FREQUENCY SHIFT AND  
SINGLE MODE OF OPERATION  
A67-16657

EFFECTS OF GAIN SATURATION BY STRONG TRAVELING  
FIELDS IN DILUTE LASER MEDIA, NOTING ATOMIC MOTION  
AND LINE BROADENING  
A67-20126

RAMAN GENERATOR FOR AMPLIFICATION OF COHERENT  
RADIATION, AND SPECTRAL CHARACTERISTICS OF  
GAS LASER WITH ONE DIRECTION TRAVELING WAVE  
PROPAGATION  
FTD-MT-65-399  
N67-11313

MULTIMODALITY OF GAS LASER IN RESONATOR WITH  
ONE DIRECTION TRAVELING WAVE PROPAGATION  
N67-11315

MODE COUPLING EFFECTS DUE TO SCATTERING IN  
TRAVELING WAVE HELIUM-NEON RING LASER  
NASA-CR-82490  
N67-19096

**TRAVELING WAVE AMPLIFIER**  
NONLINEAR PROPAGATION OF PULSE SIGNAL IN LASER  
TYPE TRAVELING WAVE AMPLIFIER  
A67-17232

**TRAVELING WAVE MASER**  
THEORETICAL EXISTENCE OF OPTIMUM PITCH GIVING  
MAXIMUM NET GAIN FOR TRAVELING WAVE MASERS, USING  
SLOW WAVE STRUCTURES  
A66-27958

DIELECTRIC MATERIAL POSITION EFFECT ON  
CHARACTERISTICS OF LADDER LINE SLOW WAVE STRUCTURE  
OF TW MASERS  
A66-27960

DISPERSION CHARACTERISTIC OF STUB SLOW-WAVE  
STRUCTURE, PARTIALLY FILLED BY DIELECTRIC, OF  
TRAVELING WAVE MASER  
A66-26291

TRUNCATED EQUATIONS DESCRIBING COHERENT RADIATION  
OF EXCITED CHROMIUM IONS IN RUBY SITUATED IN  
TRAVELING WAVE RESONATOR  
A66-31547

L-BAND TRAVELING WAVE MASER USING CHROMIUM DOPED  
RUTILE, DISCUSSING INVERTED SUSCEPTIBILITY AS  
FIGURE OF MERIT  
A66-38239

TRAVELING WAVE MASER AS PREAMPLIFIER IN GROUND  
STATION FOR SATELLITE COMMUNICATION  
A66-40658

DUAL CHANNEL TRAVELING WAVE HYDROGEN MASER FOR

- FREQUENCY GENERATION AND CONTROL  
N66-38555
- TRAVELING WAVE MASER FOR 85-FOOT ANTENNA AT VENUS DEEP SPACE STATION  
N66-38567
- MICROWAVE MIXING IN PARAMAGNETIC CRYSTAL USING TRAVELING WAVE MASER WITH RUBY AS MIXER ELEMENT, NOTING FREQUENCY CONVERSION  
A67-10003
- ULTRALOW-NOISE TUNABLE S-BAND AMPLIFIER USING TWM AS SECOND STAGE  
A67-10106
- COMPETITION OF TWO TYPES OF OSCILLATIONS IN TRAVELING WAVE LASER  
A67-10362
- R CA DEFENSE ELECTRONIC PRODUCTS APPLIED RESEARCH  
A67-11785
- TRAVELING WAVE MASER CONSISTING OF PARAMAGNETIC CRYSTAL /CHROMIUM DOPED RUTILE/, SLOW WAVE CIRCUIT AND FERRITE ISOLATOR, DISCUSSING PERFORMANCE, STAGGER TUNING, ETC  
A67-11787
- FERRIC-DOPED-RUTILE 8 MM TRAVELING WAVE MASER, NOTING OPERATING RANGE AND PERFORMANCE CHARACTERISTICS  
A67-13986
- AMPLITUDE AND FREQUENCY CHARACTERISTICS OF TRAVELING WAVE RING LASER  
A67-15777
- COMPETITION OF TWO TYPES OF OSCILLATIONS IN TRAVELING WAVE LASER  
A67-17620
- IRON DOPED RUTILE TRAVELING WAVE MASER OPERATING IN 34-36 G HZ FREQUENCY RANGE  
A67-19605
- TRAVELING WAVE EXCITATION OF HIGH POWER NITROGEN AND NEON LASERS WITH VELOCITY MATCHING THAT OF STIMULATED EMISSION  
A67-20093
- TRAVELING WAVE MASER FOR RADIO ASTRONOMY INTERFEROMETER NOTING SUPERCONDUCTING MAGNET, DYNAMO AND CRYOSTAT  
A67-20115
- HELIUM COOLING SYSTEM FOR SOLID STATE MASER AMPLIFIER INSTALLATION AT COMMUNICATION SATELLITE GROUND STATION  
N67-12314
- TUNING RANGE EXTENSION OF KLYSTRONS USED FOR PUMPING S-BAND TRAVELING WAVE MASERS  
N67-14441
- DUAL CHANNEL TRAVELING WAVE MASER FOR INTEGRATION IN CLOSED CYCLE REFRIGERATOR  
N67-15908
- LOW NOISE RECEIVERS - TRAVELING WAVE MASER DEVELOPMENT  
N67-15913
- TUNABLE TRAVELING WAVE MASER FOR DEEP SPACE COMMUNICATIONS AND PLANETARY RADAR  
JPL-TR-32-1072  
N67-17168
- TRAVELING WAVE MODULATION  
RADIATION CONTROL OF RUBY LASER BY DIFFRACTION MODULATOR WITH TRAVELING ULTRASONIC WAVE, NOTING COMPUTER SOLUTION OF KINETIC EQUATIONS OF POPULATION BALANCE, RADIATION DENSITY, CHARACTERISTIC DAMPING, ETC  
A66-33515
- EXPERIMENTAL STUDY OF EMISSION CONTROL IN RUBY LASER USING DIFFRACTION MODULATOR WITH MODULATED TRAVELING ULTRASONIC WAVE  
A66-33516
- RADIATION CONTROL OF RUBY LASER BY DIFFRACTION MODULATOR WITH TRAVELING ULTRASONIC WAVE, NOTING COMPUTER SOLUTION OF KINETIC EQUATIONS OF POPULATION BALANCE, RADIATION DENSITY, CHARACTERISTIC DAMPING, ETC  
A66-42128
- EXPERIMENTAL STUDY OF EMISSION CONTROL IN RUBY LASER USING DIFFRACTION MODULATOR WITH MODULATED TRAVELING ULTRASONIC WAVE  
A66-42129
- TROPOSPHERE  
TROPOSPHERIC PROPAGATION USING LASER AS TRANSMITTER, ANALYZING EFFECTS OF BENARD CELLS, TURBULENCE, WIND SHEAR, ETC  
A66-42367
- TUNGSTEN  
POSITIVE ION EMISSION FROM TUNGSTEN SURFACES LASER IRRADIATED STUDIED, USING TIME-OF-FLIGHT SPECTROMETER  
A67-16651
- TUNING  
TUNING OF AMMONIA BEAM MASER RESONATOR BASED ON FREQUENCY SHIFT METHOD, NOTING HYSTERESIS APPEARANCE AND ELIMINATION  
A66-31696
- TWO-FREQUENCY VOLUME RESONATOR WITH INDEPENDENT TUNING WITHIN WIDE FREQUENCY BAND  
A67-11911
- TUNABLE DISPERSION RESONATOR AND BROADENING OF LASER EMISSION SPECTRAL RANGE TO OBTAIN OPERATING FREQUENCY OTHER THAN FUNDAMENTAL  
A67-13131
- TUNING OF GAS LASER RESONATOR  
A67-19505
- TUNNEL DIODE  
SURFACE ASPECTS OF THERMAL DEGRADATION OF GA AS P-N JUNCTION LASERS AND TUNNEL DIODES  
A67-15620
- TURBULENCE MEASURING APPARATUS  
LASER APPLICABILITY TO LINE-OF-SIGHT ATMOSPHERIC TURBULENCE PARAMETERS  
A67-17383
- TURBULENT DIFFUSION  
LASER VELOCIMETER MEASUREMENT OF POINT VELOCITIES IN TURBULENT LIQUID FLOW IN PIPE, USING STATISTICAL ANALYSIS TO VERIFY RESULTS  
AIAA PAPER 67-179  
A67-18511
- TURBULENT FLOW  
EFFECTIVE DIFFUSION CROSS SECTION OF ULTRASONIC AND LASER BEAM WHILE ACTING ON TURBULENT FLOW  
A66-25404
- TURBULENT JET  
FIZEAU FRINGES PRODUCED IN LASER ILLUMINATED FABRY- PEROT INTERFEROMETER TO OBTAIN CONCENTRATION PROFILES IN TURBULENT AND LAMINAR JETS  
A67-17371
- TWO-PHASE FLOW  
PARTICLE VELOCITY IN GAS PARTICLE TWO-PHASE NOZZLE EXPANSION USING GAS LASER AND FABRY- PEROT INTERFEROMETER FOR ROCKET ENGINE PROPULSION  
AIAA PAPER 66-522  
A66-31500
- U**
- U.S.S.R.  
AEROSPACE TECHNOLOGY RESEARCH IN U.S.S.R. - LASER ACTION BY SUPERCOOLED PLASMA, LITHIUM CRYSTAL GROWTH, METALLOSILOXANE POLYMER SYNTHESIS AND SPACE TECHNOLOGY CINEMATOGRAPHY  
N66-32699
- RAMAN GENERATOR FOR AMPLIFICATION OF COHERENT RADIATION, AND SPECTRAL CHARACTERISTICS OF GAS LASER WITH ONE DIRECTION TRAVELING WAVE PROPAGATION  
FTD-MT-65-399  
N67-11313
- SOVIET QUANTUM ELECTRONICS RESEARCH  
ATD-66-97  
N67-14312
- ULTRASONIC RADIATION  
EFFECTIVE DIFFUSION CROSS SECTION OF ULTRASONIC AND LASER BEAM WHILE ACTING ON TURBULENT FLOW  
A66-25404
- MODULATION BY ULTRASONIC DIFFRACTION OF 10.6 MICRON LASER RADIATION IN PHOTOELASTIC CD S, GA AS AND SI CRYSTALS  
A66-39112
- ULTRASONIC WAVE  
EXPERIMENTAL STUDY OF EMISSION CONTROL IN RUBY LASER USING DIFFRACTION MODULATOR WITH MODULATED TRAVELING ULTRASONIC WAVE  
A66-33516
- ULTRASONIC CELL WHICH MODULATES INTENSITY OF HE- NE LASER BEAM FOR COMMUNICATION OF INTELLIGENCE  
A66-34059

EXPERIMENTAL STUDY OF EMISSION CONTROL IN RUBY LASER USING DIFFRACTION MODULATOR WITH MODULATED TRAVELING ULTRASONIC WAVE A66-42129

FREQUENCY TEMPERATURE DEPENDENCE OF LONGITUDINAL AND TRANSVERSE HYPERSONIC WAVE ABSORPTION COEFFICIENTS IN QUARTZ AND ARTIFICIAL RUBY CRYSTAL A66-42514

HORIZONTAL DEFLECTION IN TV DISPLAY PRODUCED BY BRAGG REFLECTION OF LASER LIGHT BY ULTRASONIC WAVES IN WATER A66-42816

FREQUENCY MODULATION OF GaAs SEMICONDUCTOR LASER BY ULTRASONIC WAVE MODULATION OF DIELECTRIC CONSTANT A67-16671

#### ULTRASONICS

FORMATION OF ULTRASONICALLY GATED GIANT LASER PULSES BY Q-SPOILING, NOTING PHOTOGRAPHS OF RUBY AND ROLE OF CAVITATION IN GATING MECHANISM A66-25057

ULTRASONIC MODULATION OF LASER OSCILLATION FROM NEODYMIUM GLASS ROD A66-28044

#### ULTRAVIOLET RADIATION

PULSED OPERATION OF ELECTRON-BEAM PUMPED ZINC OXIDE LASER EMITTING RADIATION IN UV AT VERY LOW TEMPERATURES, NOTING IMPORTANCE OF USE OF CAVITY A66-37768

CONTINUOUS WAVE UV IONIZED GAS LASER EMISSION OVER FOUR TRANSITIONS IN NEON, KRYPTON AND ARGON A66-37771

PULSED NITROGEN LASER DELIVERING HIGH AVERAGE POWER WITHOUT COMPLICATIONS OF CONVENTIONAL Q-SWITCHING A66-38266

SPECTROSCOPIC, CHEMICAL AND LASER PROPERTIES OF PIPERIDINIUM SALT OF EUROPIUM TETRAKIS A66-43034

MASER AMPLIFIER BASED ON UV CONTINUUM PUMPING FROM NEARBY STARS, EXPLAINING 18-CM OH EMISSION FROM ANOMALOUS H-2 REGIONS A66-43042

ULTRAVIOLET RADIATION FOR RUBY LASER PUMPING, AND ENERGY TRANSFER PROCESSES BETWEEN ELECTRON ORBITS AND BETWEEN UNLIKE IONS ML-1393 N66-24104

U V RADIATION GENERATION FROM OUTPUT OF Nd GLASS LASER BY FREQUENCY DOUBLING IN AMMONIUM DIHYDROGEN PHOSPHATE CRYSTALS A67-18712

#### ULTRAVIOLET SPECTRUM

CHARACTERISTICS OF EFFICIENT SEMICONDUCTOR LASERS IN UV PORTION OF SPECTRUM OBTAINED AT BOTH LIQUID HELIUM AND NITROGEN TEMPERATURES, USING PULSED ELECTRON BEAM EXCITATION ON ZnS CRYSTALS A66-39114

#### UNDERWATER TEST

UNDERWATER LIGHT TRANSMISSION FROM LASERS AND CONVENTIONAL LIGHT SOURCES AD-631033 N66-27790

#### UPCONVERTER

ULTRALOW-NOISE TUNABLE S-BAND AMPLIFIER USING TWM AS SECOND STAGE A67-10106

#### UPPER ATMOSPHERE

DETECTING CONCENTRATION OF NITRIC OXIDE IN METASTABLE STATE IN UPPER ATMOSPHERE, USING GIANT-PULSE RAMAN LASER SOURCES A66-43022

DENSITY AND TEMPERATURE OF UPPER ATMOSPHERE, SATELLITE TRACKING, GEODETIC APPLICATIONS AND LONG DISTANCE MEASUREMENTS, USING LASER OUTPUT A67-17591

#### URANIUM OXIDE

SPECTROSCOPY OF LITHIUM FLUORIDE CRYSTALS ACTIVATED WITH URANIUM TRIOXIDE FOR LASER ACTION, SHOWING ANOMALOUS FLUORESCENT DECAY UNDER HIGH INTENSITY PUMPING A66-25997

#### URANYL

PROPERTIES OF URANYL-DOPED GLASS FOR APPLICATION AS SATURABLE OPTICAL FILTER FOR USE WITH LASERS A67-10009

## V

#### VACUUM FURNACE

EXTENSOMETER FOR MEASURING SMALL CHANGES OF SPECIMEN ON TENSILE TESTING VACUUM FURNACE AT HIGH TEMPERATURES, USING CW GAS LASER AS LIGHT SOURCE A67-11036

#### VANADATE

SPECTRAL PROPERTIES OF Nd DOPED YTTRIUM VANADATE GROWN FROM MELT, NOTING REDUCED STARK SPLITTING LEADING TO LASER ACTION A67-19559

#### VANADIUM OXIDE

YTTRIUM VANADATE CRYSTALS GROWN AND PROCESSED FOR OPTICAL PURPOSES A66-35434

#### VAPOR DEPOSITION

RUBY LASER USED IN VAPOR DEPOSITION OF THIN METAL FILMS UD-2037-E-1 N66-32219

#### VAPOR PHASE

LASER INDUCED BREAKDOWN OF COMPLEX ORGANIC MOLECULES IN VAPOR STATE, NOTING EMISSION ACCOMPANIED BY FORMATION OF PARTIALLY DISSOCIATED HOT GAS A67-12451

#### VAPORIZATION HEAT

CLEAVAGE AND SEPARATION OF DYE-DOPED ICE AND PARAFFIN INSTANTANEOUSLY HEATED BY LASER PULSE, MEASURING MECHANICAL PULSE AT ENERGY CONCENTRATIONS BELOW VAPORIZATION HEAT A67-18807

#### VARIATIONAL CALCULUS

TEMPERATURE FIELD OF ACTIVE MEDIUM OF PULSED LASER USING VARIATIONAL METHODS, CONSIDERING TWO APPROXIMATE SOLUTIONS A67-16935

#### VELOCITY ERROR

VELOCITY ABERRATION AND ATMOSPHERIC REFRACTION PERTAINING TO LASER SATELLITE COMMUNICATION EXPERIMENTS, OBTAINING EQUATIONS FOR ESTIMATION OF EFFECTS A67-12054

#### VELOCITY MEASUREMENT

LASER DOPPLER VELOCIMETER FOR MEASURING LOCALIZED FLOW VELOCITIES IN LIQUIDS A66-27053

LASER DOPPLER VELOCIMETER FOR GAS AND LIQUID FLOW VELOCITY MEASUREMENT A66-42557

KINETIC ENERGIES OF IONS PRODUCED BY GIANT LASER PULSES, NOTING DEPENDENCE OF MEAN SQUARE ION VELOCITY ON PULSE PEAK INTENSITY A67-15099

LASER VELOCIMETER MEASUREMENT OF POINT VELOCITIES IN TURBULENT LIQUID FLOW IN PIPE, USING STATISTICAL ANALYSIS TO VERIFY RESULTS AIAA PAPER 67-179 A67-18511

VELOCITY DISTRIBUTION FUNCTION MEASUREMENT OF GAS BASED ON LASER BEAM ATTENUATION SUDAAR-275 N67-18270

#### VELOCITY PROFILE

EFFECTIVE DIFFUSION CROSS SECTION OF ULTRASONIC AND LASER BEAM WHILE ACTING ON TURBULENT FLOW A66-25404

PLASMA FLOW VELOCITY PROFILE MEASUREMENT BY ELECTROSTATIC PROBE DETECTION OF PLASMA DROP CAUSED BY GAS BREAKDOWN DUE TO FOCUSED GIANT PULSE LASER A66-38395

#### VERTICAL DISTRIBUTION

LASER RADAR RETURNS FROM LOWER TROPOSPHERE COMPARED WITH VERTICAL OZONE DISTRIBUTIONS INDICATE INVERSE RELATIONSHIP A67-14676

#### VIBRATION EFFECT

PERTURBATION OF RUBY LASER BY VIBRATING ONE OF



- MIRRORS CONSTITUTING RESONANT CAVITY  
A66-42999
- TRANSIENT AND STEADY STATE IR EMISSION FROM LOW-  
LYING VIBRATIONAL LEVELS OF CARBON DIOXIDE IN  
LASER SYSTEMS, USING DC DISCHARGE  
A67-16630
- VIBRATION MEASUREMENT**  
LASER APPLICATION FOR VIBRATION MEASUREMENT  
UTILIZING DOPPLER SHIFT PRODUCED ON WAVE  
REFLECTED FROM SURFACE VIBRATING NORMAL TO BEAM  
PATH  
A66-35673
- LASER TECHNIQUES FOR DETECTING AND MEASURING  
VIBRATIONS OF SPACECRAFT MODEL ON SHAKE TABLE  
NASA-CR-75643  
N66-27953
- VIBRATION MEASURING APPARATUS**  
LASER ACCELERATOR CALIBRATOR AS STANDARD FOR  
VIBRATION DISPLACEMENT MEASUREMENTS  
N66-28461
- VIBRATIONAL FREQUENCY**  
STIMULATED EMISSION OF POLYMETHINE DYES UPON  
PUMPING WITH Q-SWITCHED LASER, NOTING WAVELENGTH  
PARAMETERS AND OSCILLATION  
A66-42247
- VIBRATIONAL RELAXATION**  
I R MASER ACTION ON VIBRATIONAL TRANSITIONS OF  
THERMALLY PUMPED POLYATOMIC MOLECULES  
A66-26203
- LASER ACTION ON VIBRATIONAL-ROTATIONAL TRANSITIONS  
AND VIBRATION ENERGY TRANSFER  
A66-26204
- VIBRATIONAL EXCITATION, POPULATION INVERSION AND  
COUPLING OUT OF CARBON DIOXIDE-NITROGEN-WATER  
VAPOR LASER  
A66-33758
- MODE SELECTION, RELAXATION OSCILLATIONS, MODE  
INTERACTION AND THERMAL EFFECTS IN ROOM  
TEMPERATURE CW LASERS IN ELLIPSOIDAL PUMPING  
SYSTEMS  
A66-42546
- STEADY STATE LASER RADIATION DURING RELAXATION,  
DISCUSSING TIME-DEPENDENT SPECTRAL COMPOSITION,  
OSCILLATION MODES AND POLARIZATION CHARACTERISTICS  
A67-13134
- MOLECULAR GAS LASER Q-SWITCHING TECHNIQUES,  
DETERMINING ROTATIONAL COLLISION SECTIONS FOR  
CARBON DIOXIDE AND CROSS SECTIONS FOR VIBRATIONAL  
RELAXATION  
A67-16632
- VIBRATIONAL SPECTRUM**  
VIBRATIONAL-ROTATIONAL LINE STRENGTHS AND WIDTHS  
IN CARBON DIOXIDE, USING CARBON DIOXIDE-NEON LASER  
A66-27030
- OPTICAL MASER OSCILLATION LINES IN HF DISCHARGE  
IN MIXTURE OF AR AND BR  
A67-18545
- VISIBLE RADIATION**  
SUM AND DIFFERENCE FREQUENCY MIXING OF VISIBLE AND  
IR GAS LASER LIGHT IN GA P AT NEAR RESTSTRAHL  
FREQUENCIES AND RELATIONSHIP TO SPONTANEOUS RAMAN  
SCATTERING  
A67-15464
- VISIBLE SPECTRUM**  
FAR IR RADIATION DETECTED AT VISIBLE FREQUENCY,  
USING NONLINEAR OPTICAL MIXING WITH LASERS  
A66-33322
- COHERENT LASER-TYPE LIGHT GENERATORS WITH  
CAPABILITY OF ADJUSTING FREQUENCY OVER VISIBLE  
SPECTRUM  
A66-36265
- THREE NEW VISIBLE CW LASER LINES IN DISCHARGE IN  
SINGLY-IONIZED CL  
A67-10373
- FLASHLIGHT /INCOHERENT/ PUMPING OF VISIBLE AND  
IR, IN SB AND CD S- CD SE LASERS  
A67-10447
- VISUAL ACUITY**  
VISUAL ACUITY DECREMENT FROM LASER LESION IN FOVEA  
OF STUMP TAIL MACAQUE MONKEYS  
A67-16287
- VISUAL DISPLAY**  
GAS LASER USED TO DETERMINE RESIDUAL WEDGE ANGLE  
IN OPTICAL FLATS AND DIRECT DISPLAY OF RELIEF MAPS  
A66-35390
- HIGH POWER VISIBLE CW GAS LASER BEAM GENERATION,  
MODULATION AND DEFLECTION FOR APPLICATION TO  
VISUAL DISPLAY TECHNOLOGY  
SMPTE PREPRINT 100-6  
A67-13801
- LASER DISPLAYS APPLICATION, PERFORMANCE AND STATUS  
OF EXISTING DEVICES  
A67-17887
- VOICE COMMUNICATION**  
VOICE COMMUNICATIONS SYSTEM USING GA AS ROOM-  
TEMPERATURE INJECTION LASER AND TV COMMUNICATIONS  
SYSTEM USING GA AS CRYSTALS AS MODULATORS FOR  
LASER BEAMS  
A67-11786
- VOLT-AMPERE CHARACTERISTICS**  
VOLT-AMPERE CHARACTERISTICS AND OTHER PROPERTIES  
OF GA AS LASERS WITH TELLURIUM AND ZN-DOPED  
EPITAXIAL P-N JUNCTION  
A67-10080
- I- V CHARACTERISTIC OF GA AS DIODE WITH FABRY-  
PEROT RESONATOR, NOTING VARIATIONS DURING  
AMPLIFICATION TO GENERATION TRANSITION  
A67-15132
- RECOMBINATION RADIATION OF P-N JUNCTIONS IN GA AS  
WITH AND WITHOUT FABRY- PEROT CAVITY, DISCUSSING  
NONEQUILIBRIUM CURRENT CARRIER KINETICS AND I-V  
CHARACTERISTICS  
A67-18934
- VOLTAGE BREAKDOWN**  
BREAKDOWN OF GASES UNDER INFLUENCE OF LASER SPARK  
PHENOMENA WITH SUBSEQUENT ABSORPTION OF LASER  
RADIATION AND GAS HEATING  
A66-32061
- W**
- WALL TEMPERATURE**  
DISCHARGE TUBE DIMENSIONS, FLOW RATE, WALL  
TEMPERATURE, AND GAS MIXTURES DEFINED FOR CARBON  
DIOXIDE GAS LASER  
NASA-CR-81332  
N67-16633
- WATER VAPOR**  
118-MICRON WAVELENGTH WATER VAPOR GAS LASER WITH  
4-INCH DIAMETER TWO-METER FOCAL LENGTH MIRROR  
RESONATOR SYSTEM  
A66-29010
- LASER ACTION IN CLOSED MOLECULAR SYSTEM WITH  
MIXTURE OF CARBON DIOXIDE, NITROGEN AND WATER  
VAPOR, NOTING COUPLING-OUT PLATE REFLECTIVITY AND  
POPULATION INVERSION  
A66-35433
- WATER VAPOR ABSORPTION SPECTRA IN SUBMILLIMETER  
WAVE REGION, ANALOG-TO-DIGITAL CONVERSION AND  
RECORDING SYSTEM, AND CARBON DIOXIDE LASER  
CONSTRUCTION  
NASA-CR-74971  
N66-26261
- THERMALLY TUNED RUBY LASER RADAR FOR DETERMINING  
VERTICAL PROFILE OF ATMOSPHERIC WATER VAPOR  
TR-66-9  
N66-35539
- TIME BEHAVIOR OF PULSED WATER VAPOR LASER, NOTING  
SPIKING FROM FAR IR EMISSION LINES  
A67-20095
- MEASUREMENT AND THEORY, INCLUDING SIGNAL TO NOISE  
AND TRANSFER FUNCTION CALCULATIONS, OF  
ATMOSPHERIC WATER VAPOR USING RUBY LASER OPTICAL  
RADAR  
N67-13488
- WAVE ATTENUATION**  
LASER OSCILLATION EFFECT ON CHARACTERISTICS OF  
ELECTRON GAS OF HELIUM-NEON LASER PLASMA STUDIED  
IN TERMS OF WAVE ATTENUATION IN PLASMAGUIDE  
A66-43006
- WAVE DIFFRACTION**  
PERSPECTIVE RENDERING OF FIELD INTENSITY  
DIFFRACTED AT CIRCULAR APERTURE WITH REFERENCE TO  
LASER-SCANNING TECHNIQUE  
A66-28843
- MODULATION BY ULTRASONIC DIFFRACTION OF 10.6  
MICRON LASER RADIATION IN PHOTOELASTIC CD S,

- GA AS AND SI CRYSTALS A66-39112
- 10.6 MICRON OUTPUT OF CARBON DIOXIDE- HE LASER  
MODULATED, USING BRAGG DIFFRACTION FROM  
LONGITUDINAL ACOUSTIC WAVES IN TE A66-42251
- SELF-TRAPPING OF LASER BEAM DUE TO DIFFRACTION  
FROM DIELECTRIC WAVEGUIDE ARISING FROM  
PERMITTIVITY INCREASE OF BIREFRINGENT BEAM A66-42554
- CONFIGURATIONS FOR REALIZATION OF MULTIPLE LASER  
LIGHT SCATTERING USING MICROWAVE ACOUSTIC WAVES  
AND TWO PORRO PRISMS A66-42636
- INTERFERENCES BETWEEN WAVES DIFFRACTED BY CIRCULAR  
SCREENS OR THIN WIRES AND COHERENT BACKGROUND  
PROVIDED BY LASER, PRODUCING RINGS OR RECTILINEAR  
FRINGES A67-10231
- INTERFERENCES BETWEEN COHERENT LIGHT BACKGROUND  
AND LIGHT DIFFRACTED BY SMALL APERTURE IN CASE OF  
STRONGLY ASTIGMATIC BEAM A67-14416
- WAVE EQUATION**
- COUPLED WAVE FORMALISM, GIVING UNIFIED DESCRIPTION  
OF PARAMETRIC DOWN CONVERSION OF LIGHT, STIMULATED  
BRILLOUIN AND RAMAN EFFECTS, ETC, STRESSING  
EXPONENTIAL CHARACTER OF GAIN A66-26156
- COMPETITION OF TWO TYPES OF OSCILLATIONS IN  
TRAVELING WAVE LASER A67-10362
- SELF-FOCUSING OF LASER BEAM IN PLASMA, SOLVING  
WAVE EQUATION FOR SLAB AND CYLINDRICAL BEAM  
CONFIGURATIONS A67-12089
- COMPETITION OF TWO TYPES OF OSCILLATIONS IN  
TRAVELING WAVE LASER A67-17620
- WAVE EXCITATION**
- TRAVELING WAVE EXCITATION OF HIGH POWER NITROGEN  
AND NEON LASERS WITH VELOCITY MATCHING THAT OF  
STIMULATED EMISSION A67-20093
- WAVE FRONT DEFORMATION**
- SPATIAL COHERENCE OF LASER LIGHT BEAM AFTER  
EXTREME WAVEFRONT DISTORTIONS ON DIFFUSION  
EXPLAINED ON BASIS OF FRAUNHOFER AND FRESNEL  
DIFFRACTION A67-11062
- WAVE FRONT RECONSTRUCTION**
- HOLOGRAMS AND WAVEFRONT RECONSTRUCTION TECHNIQUES  
INVOLVING PRISMATIC REFRACTION OF MONOCHROMATIC  
AND COHERENT LASER LIGHT CAUSING INTERFERENCE  
PATTERN ON PHOTOGRAPHIC EMULSION A66-25144
- HOLOGRAPHY PRINCIPLES AND DEVELOPMENT, CONSIDERING  
WAVE FRONT RECONSTRUCTION, LIPPMANN PHOTOGRAPHY,  
LASER LIGHT, APPLICATION TO TV, ETC A66-35244
- FOURIER TRANSFORM HOLOGRAPHY FOR DIFFUSION OF  
COHERENT LASER LIGHT BEAM, EXAMINING DISTORTION  
TERM IN RECONSTRUCTED IMAGE A67-11063
- LASER HOLOGRAPHY, DISCUSSING VARIOUS METHODS OF  
WAVE FRONT RECONSTRUCTION A67-19092
- WAVE INCIDENCE CONTROL**
- WAVE SYNCHRONIZATION IN GAS LASER WITH RING  
RESONATOR CAVITY A66-39301
- WAVE INTERACTION**
- TRAVELING WAVES INTERACTION IN GAS LASER,  
EXPLAINING FORCING-OF-OSCILLATIONS AND TRAVELING  
WAVE SUPPRESSION EFFECT A66-34685
- LINEARLY AND CIRCULARLY POLARIZED FIELDS IN LASER  
AMPLIFIER INTERACTION WITH AXIAL MAGNETIC FIELD,  
EMPHASIZING COMBINATION TONE PRODUCTION A66-41624
- RADIATION INTERACTION BETWEEN LASER OSCILLATORS  
WITH DIFFERENT ACTIVE MATERIALS AND FREQUENCIES  
A66-42549
- TRAVELING WAVES INTERACTION IN GAS LASER,  
EXPLAINING FORCING-OF-OSCILLATIONS AND TRAVELING  
WAVE SUPPRESSION EFFECT A67-14371
- WAVE INTERACTION IN SATURABLE ABSORBERS, NOTING  
HOLE BURNING IN DYE SWITCHED RUBY LASER A67-20094
- WAVE MOTION**
- THEORETICAL EXISTENCE OF OPTIMUM PITCH GIVING  
MAXIMUM NET GAIN FOR TRAVELING WAVE MASERS, USING  
SLOW WAVE STRUCTURES A66-27958
- WAVE PROPAGATION**
- ATMOSPHERIC TURBULENCE EFFECT ON LASER BEAM  
INTENSITY DISTRIBUTION A66-41030
- OPTICAL COMMUNICATION SYSTEMS, DISCUSSING  
AVAILABLE EQUIPMENT, TRANSMISSION CHARACTERISTIC,  
LACK OF LONG DISTANCE OPERATION RELIABILITY, ETC  
A66-42805
- WAVE REFLECTION**
- LASER APPLICATION FOR VIBRATION MEASUREMENT  
UTILIZING DOPPLER SHIFT PRODUCED ON WAVE  
REFLECTED FROM SURFACE VIBRATING NORMAL TO BEAM  
PATH A66-35673
- WAVE SCATTERING**
- DATA RECORDING AND PROCESSING SYSTEMS FOR GT-7  
LASER COMMUNICATOR EXPERIMENT - LASER WAVE  
SCATTERING DUE TO REFRACTIVE INDEX PERTURBATIONS  
IN PROPAGATING MEDIUM NASA-CR-65553 N66-39966
- WAVEGUIDE**
- LASER COMMUNICATION BY OPTICAL BEAM WAVEGUIDE  
A66-30594
- TRAJECTORIES OF LIGHT RAYS THROUGH MEDIUM  
SUBJECTED TO ACOUSTIC WAVES EXAMINED KNOWING THAT  
ACOUSTIC WAVES IN LASER MEDIUM FUNCTION AS OPTICAL  
WAVEGUIDE A66-38238
- SELF-TRAPPING OF LASER BEAM DUE TO DIFFRACTION  
FROM DIELECTRIC WAVEGUIDE ARISING FROM  
PERMITTIVITY INCREASE OF BIREFRINGENT BEAM A66-42554
- ALL-SOLID WAVEGUIDE COMPONENTS FOR SLOT COUPLERS  
AND WAVEGUIDE LASER NASA-CR-76893 N66-32757
- DESIGNS OF QUANTUM ELECTRONIC SYSTEMS - RUBY  
LASERS, QUANTUM AND OPTICAL GENERATORS, OPTICAL  
GATES, WAVEGUIDES, ELECTROMAGNETIC WAVE  
PROPAGATION, AND COMMUNICATION SYSTEMS  
JPRS-37132 N66-37709
- WAVEGUIDE ANTENNA**
- MAGNETO-OPTIC OBSERVATIONS WITH GAS LASER, HIGH  
SPEED MAGNETIZATION REVERSAL EQUIPMENT, INFRARED  
ABSORPTION SPECTRA, AND CONTINUOUS SOURCE  
WAVEGUIDE ANTENNA SYNTHESIS NAVWEPS-8847 N66-30157
- TRAVELING WAVE MASER FOR 85-FOOT ANTENNA AT VENUS  
DEEP SPACE STATION N66-38567
- WAVEGUIDE TUNER**
- TWO-FREQUENCY VOLUME RESONATOR WITH INDEPENDENT  
TUNING WITHIN WIDE FREQUENCY BAND A67-11911
- WAVELENGTH**
- SPATIAL SELECTIVE FADING AS RANDOM PROCESS,  
DISCUSSING SPATIAL COHERENCE, WAVE NUMBER  
DISPERSION PROFILE, TIME DELAY PROFILE, ETC, IN  
IONOSPHERIC PROPAGATION A66-26859
- GAS LASERS FOR INTERFEROMETRIC MEASUREMENTS OF  
LENGTHS, NOTING METHODS THAT STABILIZE WAVELENGTHS  
OF LASERS A66-31697
- DYNAMIC LASER WAVELENGTH SELECTION BY INSERTION OF  
DISPERSIVE TUNABLE ELECTRO-OPTIC Q-SPOILER WITHIN  
LASER CAVITY A66-40866
- WAVELENGTH DEPENDENCE OF SPECTRUM OF LASER BEAMS

TRAVERSING ATMOSPHERE A67-16793

WEAPON SYSTEM  
AIRBORNE LASER DRIVEN WEAPON SIMULATOR  
NAVTRADEVCE-1867-1 N66-35051

WEATHER RADAR  
GALLIUM ARSENIDE DIODE LASER AS PULSED IR SOURCE  
FOR EXPERIMENT AND DESIGN CONSIDERATIONS FOR RADAR  
INDICATION OF CLOUD HEIGHT AND VISIBILITY A66-33616

WEDGE  
GAS LASER USED TO DETERMINE RESIDUAL WEDGE ANGLE  
IN OPTICAL FLATS AND DIRECT DISPLAY OF RELIEF MAPS  
A66-35390

WELDING  
HEATING PROCESS IN LASER WELDING OF METAL SHEETS,  
TAKING INTO ACCOUNT ENERGY DISTRIBUTION, HEAT  
TRANSFER AND FLUX DENSITIES A66-29989

LASER WELDING FOR ADVANCED ELECTRONIC PACKAGING  
A66-31593

TEMPERATURE DISTRIBUTION IN TWO-LAYER PLATE DURING  
WELDING BY LASER LIGHT FLUX A66-40194

MANUFACTURING RESEARCH IN SUPPORT OF SATURN V -  
TIME-TEMPERATURE AS COMMON DENOMINATOR IN  
WELDING, PINK RUBY LASER FOR DRILLING AND  
WELDING, AND MAGNETIC-FIELD TOOLS  
NASA-TM-X-53505 N66-36420

SUPERPOWER LASERS AND MAGNETIC FIELD TOOLS FOR USE  
IN DRILLING AND WELDING N66-36423

TEMPERATURE DISTRIBUTION IN BILAYER SHEET DURING  
WELDING WITH LASER BEAM  
JPRS-37856 N66-39411

TEMPERATURE DISTRIBUTION IN TWO-LAYER PLATE  
DURING WELDING BY LASER LIGHT FLUX  
A67-17548

WELDING MACHINE  
MODULAR LIQUID-COOLED CYLINDRICAL RUBY LASER  
MICROWELDER DESIGN AND CONSTRUCTION A67-15310

WIDEBAND COMMUNICATION  
COHERENT TRANSMISSION OF OPTICAL RADAR FROM LASER  
SOURCE AND USE OF RF SUBCARRIERS PLACED ON  
OPTICAL BEAMS FOR WIDEBAND COMMUNICATIONS PURPOSES  
A66-28404

WIRE  
LASER TECHNIQUE ACQUISITION OF DATA ON EXPLODING-  
WIRE PHENOMENA IN EXPLOSION MODEL, SUPERSONIC  
MODEL AND ABLATION MODEL A66-41701

X

X-BAND  
X-BAND RUBY MASER DESIGN WITH LIQUID HYDROGEN  
COOLING FOR HIGH GAIN AT LOW PUMPING POWER  
A67-19131

X-RAY  
TEMPERATURE MEASUREMENTS OF LASER SPARKS FROM  
RELATIVE INTENSITY OF X-RAY FLUX TRANSMITTED  
THROUGH BERYLLIUM FOILS OF DIFFERENT THICKNESS  
A66-40421

XENON  
MULTIPHOTON IONIZATION OF XENON ATOM IN POWERFUL  
ELECTRIC FIELD BY RUBY LASER RADIATION A66-39545

PULSED ARC XENON DISCHARGES USED FOR OPTICAL  
PUMPING OF HIGH ENERGY LASERS  
AD-632892 N66-31537

MAGNETICALLY TUNABLE IR MASERS OF HELIUM-XENON,  
CONSIDERING EXPERIMENTAL PROBLEM IN APPLYING  
TUNABLE IR MASER TO IR SPECTROSCOPY  
A67-14764

XENON 129  
GAS LASER SPECTROSCOPIC ANALYSIS OF HYPERFINE  
STRUCTURE, PARAMAGNETIC PROPERTIES, RADIATIVE  
LIFETIMES AND DOPPLER-BROADENED TRANSITION  
SATURATION BEHAVIOR OF EXCITED STATES OF Xe 129  
A67-15462

## Y

YTTRIUM-ALUMINUM GARNET /YAG/ CRYSTAL  
NEODYMIUM DOPED YAG CRYSTAL AND LITHIUM META  
NIOBATE AS CW LASER MATERIALS AND POTASSIUM  
TANTALUM NIOBATE AS OPTICAL MODULATOR MATERIAL  
A66-25518

NEODYMIUM-DOPED YTTRIUM-ALUMINUM GARNET CRYSTAL  
LASER OSCILLATOR AS REGENERATIVE AMPLIFIER OF  
NOISE A66-26212

COHERENT EMISSION FROM TRIVALENT HOLMIUM IONS IN  
RARE EARTH SUBSTITUTED YTTRIUM ALUMINUM GARNET,  
NOTING THREE ENERGY TRANSFER COMBINATIONS IN YAG  
A66-28690

ULTRASHORT OPTICAL PULSES GENERATED BY MODE  
LOCKING CONTINUOUS NEODYMIUM DOPED YTTRIUM-  
ALUMINUM GARNET LASER A66-29391

SUN PUMPED CONTINUOUS WAVE ONE-WATT YAG CRYSTAL  
LASER, NOTING EQUIPMENT SETUP AND OUTPUT DURATION  
A66-32620

STIMULATED EMISSION, ABSORPTION SPECTRA AND  
LUMINESCENCE OF NEODYMIUM-ACTIVATED YAG CRYSTALS  
IN PULSED LASER A66-39306

SPECTRAL AND MODE PROPERTIES OF RUBY, SOLID STATE,  
FABRY-PEROT, AND NEODYMIUM-DOPED YAG LASERS  
S-852 N66-30264

YTTRIUM-ALUMINUM GARNET CRYSTAL GROWTH FROM MOLTEN  
FLUX FOR LASER APPLICATION N66-34570

OUTPUT SPECTRA OF ND DOPED YAG AND RUBY LASERS,  
DETERMINING MECHANISMS RESPONSIBLE FOR OBSERVED  
OVERALL LINewidths A67-16660

Y AG SOLID STATE LASER SYSTEM, DISCUSSING OUTPUT,  
THEORETICAL LIMITS, PERFORMANCE CHARACTERISTICS,  
ETC A67-19084

YTTRIUM COMPOUND  
YTTRIUM VANADATE CRYSTALS GROWN AND PROCESSED  
FOR OPTICAL PURPOSES A66-35434

LASER EXCITED ELECTRONIC RAMAN SPECTRUM OF  
TRIVALENT EU ION DOPED Y GA GARNET A67-11084

SPECTRAL PROPERTIES OF ND DOPED YTTRIUM VANADATE  
GROWN FROM MELT, NOTING REDUCED STARK SPLITTING  
LEADING TO LASER ACTION A67-19559

## Z

ZEEMAN EFFECT  
MULTIPLE QUANTUM EQUATIONS FOR MODE AMPLITUDE AND  
FREQUENCY DETERMINATION FOR MAGNETIC FIELD-TUNED  
GAS OPTICAL MASER A66-26200

DEPENDENCE OF ZEEMAN BEAT FREQUENCY ON  
INTERFEROMETER TUNING IN SINGLE-MODE He-Ne LASER  
WITH VARIOUS GAS PRESSURES AND MAGNETIC FIELD  
STRENGTHS A66-26201

NONLINEAR ZEEMAN EFFECT FOR GAS LASER  
A66-34181

QUENCHING AND HYSTERESIS EFFECTS BETWEEN ZEEMAN  
OSCILLATIONS ON SINGLE AXIAL MODE OBSERVED IN  
NEAR-ZERO MAGNETIC FIELDS FOR SHORT PLANAR LASER  
A66-39116

RESONATOR MADE OF MAGNETIC MATERIALS FOR TUNING  
MOLECULAR GENERATOR BY ZEEMAN MODULATION

A66-39851

LONGITUDINAL MAGNETIC FIELD EFFECT UPON GAS  
DISCHARGE, ZEEMAN EFFECT AND FARADAY EFFECT IN  
HE- NE GAS LASER A66-40586

DEPENDENCE OF EMISSION INTENSITY OF GAS LASER ON  
LONGITUDINAL AND TRANSVERSE MAGNETIC FIELDS, USING  
SIMPLIFIED MODEL A66-41092

HYDROGEN MASER BEHAVIOR UNDER COHERENT LOW  
FREQUENCY ZEEMAN TRANSITION EXCITATION  
ECOM-2706 N66-38236

LASER CHARACTERISTICS OF NARROW BAND TYPE I SOLAR  
RADIO BURST AND MAGNETIC DIPOLE TRANSITIONS IN  
SPLIT ZEEMAN SUBLEVELS OF HYDROGEN ATOMS OF  
SOLAR CORONA IN GROUND LEVEL A67-11652

HIGH RESOLUTION SPECTROSCOPY USING ZEEMAN-TUNED  
IR MASER OSCILLATING AT TRANSITIONS BETWEEN 3 AND  
9 MICRONS A67-16633

LAMB SELF-CONSISTENT THEORY AND RATE EQUATION  
APPROXIMATION STUDY OF MAGNETIC DEPOLARIZATION OF  
VAPOR AND POLARIZATION OF MONOMODE GAS LASER IN  
MAGNETIC FIELD A67-16644

## ZINC

LASING POTENTIALS OF COMPOUNDS PREPARED FROM  
ELEMENTS OF GROUP II AND GROUP IV IN PERIODIC  
TABLE N67-16953

## ZINC OXIDE

PULSED OPERATION OF ELECTRON-BEAM PUMPED ZINC  
OXIDE LASER EMITTING RADIATION IN UV AT VERY LOW  
TEMPERATURES, NOTING IMPORTANCE OF USE OF CAVITY  
A66-37768

FAR FIELD PATTERN OF SHEET-LIKE LASER BEAM FROM  
ELECTRON BOMBARDED CD S AND ZN O SINGLE CRYSTALS  
A67-19798

## ZINC SELENIDE

LASER ACTION IN ZINC SELENIDE CRYSTALS AT 4600  
ANGSTROMS PREPARED UNDER HIGH PRESSURE IN CLOSED  
CONTAINER BY GAS PHASE REACTION AND FOLLOWING  
CRYSTALLIZATION A67-20183

## ZINC SULFIDE

CHARACTERISTICS OF EFFICIENT SEMICONDUCTOR LASERS  
IN UV PORTION OF SPECTRUM OBTAINED AT BOTH LIQUID  
HELIUM AND NITROGEN TEMPERATURES, USING PULSED  
ELECTRON BEAM EXCITATION ON ZN S CRYSTALS  
A66-39114

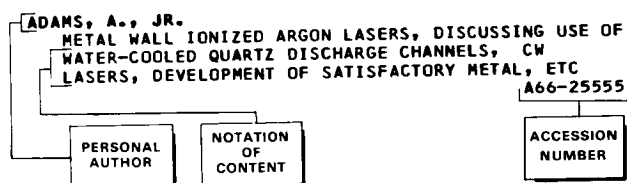
MOLECULAR SPECTROSCOPY OF ILLUMINATION EFFECTS ON  
COBALT ACTIVATED ZN S EXPOSED TO RUBY LASER  
PULSES A67-10683

# Personal Author Index

LASERS AND MASERS /a continuing bibliography with indexes

JULY 1967

## Typical Personal Author Index Listing



A Notation of Content (NOC), rather than the title of the document, is used to provide a more exact description of the subject matter. The accession number is included to assist the user in locating the abstract in the abstract section.

## A

**ABELLA, I. D.**  
PHOTON ECHO, OPTICAL ANALOG OF SPIN ECHO, IN RUBY CRYSTALS, USING RUBY LASER AS EXCITATION SOURCE  
A66-26170

**ABRAHAMS, M. S.**  
DISLOCATIONS AND PRECIPITATES IN GA AS INJECTION LASERS REVEALED BY NEW A-8 ETCHANT  
A66-31071

ORIENTATION EFFECT IN GA AS INJECTION LASERS, NOTING EMISSION CHARACTERISTICS AND STRUCTURAL SPECTRA  
A66-35404

**ABRAMOV, A. P.**  
RELATION BETWEEN NONLINEAR LUMINESCENCE QUENCHING AND CONCENTRATION OF LUMINESCENCE CENTERS IN LASER CRYSTAL  
A66-29204

RELATION BETWEEN NONLINEAR LUMINESCENCE QUENCHING AND CONCENTRATION OF LUMINESCENCE CENTERS IN LASER CRYSTAL  
A66-33053

**ABRAMS, R. L.**  
GAS LASER PUMPED MICROWAVE EMISSION FOR PRODUCING CONTROLLED EXCITED STATE POPULATION FOR RF SPECTROSCOPY OF NEON  
A67-16638

**ACKERMAN, S.**  
SYSTEMS DESIGN STUDY OF ADVANCED GEODETIC LASER SYSTEM  
AFCRL-66-731  
N67-15088

**ADAMOV, I. IU.**  
PLASMA DENSITY USING LASER BASED INTERFEROMETER, INTERPRETING PHASE SHIFT OF LASER SIGNAL AS TIME DEPENDENT LASER FREQUENCY VARIATION  
A66-35817

**ADAMS, A., JR.**  
METAL WALL IONIZED ARGON LASERS, DISCUSSING USE OF WATER-COOLED QUARTZ DISCHARGE CHANNELS, CW LASERS, DEVELOPMENT OF SATISFACTORY METAL, ETC  
A66-25555

**ADAMS, C. M., JR.**  
SOLID STATE LASER APPLICATION TO FUSION WELDING  
A66-40274

**ADAMS, S. L.**  
CURRENT CHANGES IN GAS DISCHARGE AS AFFECTED BY

LASING ACTION  
A66-27055

**ADELMAN, A. H.**  
LASER INDUCED BREAKDOWN OF COMPLEX ORGANIC MOLECULES IN VAPOR STATE, NOTING EMISSION ACCOMPANIED BY FORMATION OF PARTIALLY DISSOCIATED HOT GAS  
A67-12451

**ADLER, R.**  
HORIZONTAL DEFLECTION IN TV DISPLAY PRODUCED BY BRAGG REFLECTION OF LASER LIGHT BY ULTRASONIC WAVES IN WATER  
A66-42816

**ADRIANOVA, I. I.**  
EXPERIMENTAL STUDY OF EMISSION CONTROL IN RUBY LASER USING DIFFRACTION MODULATOR WITH MODULATED TRAVELING ULTRASONIC WAVE  
A66-33516

EXPERIMENTAL STUDY OF EMISSION CONTROL IN RUBY LASER USING DIFFRACTION MODULATOR WITH MODULATED TRAVELING ULTRASONIC WAVE  
A66-42129

**AFANASEV, IU. V.**  
GAS DYNAMIC EQUATIONS FOR DETERMINATION OF HEATING, VAPORIZATION AND EXPANSION OF SUBSTANCE DUE TO Q-SWITCHED LASER RADIATED COLLIMATES ONTO SURFACE OF SOLIDS  
A67-16652

LASER RADIATION EFFECT ON HEATING PROCESS AND GAS DYNAMIC MOTION OF FINITE TRANSPARENT GAS AND MOTIONLESS COLD GAS AT VACUUM INTERFACE  
A67-17008

**AHEARN, W. E.**  
I R GA AS LASER AMPLIFIER WITH GAINS AS HIGH AS 2000, OUTPUT POWERS OF 150 MW AND SATURATION OCCURRING WITH CURRENT INCREASE AT LOW LIGHT LEVELS  
A66-42562

LINE WIDTH OF CW GA- AS LASERS MEASURED USING HOMODYNE DETECTION AND AUTOCORRELATION  
A67-16670

**AHMED, S.**  
DIRECT CURRENT PUMPING AND COMBINED MICROWAVE ELECTRON-CYCLOTRON RESONANCE WITH DIRECT CURRENT PUMPING EFFECTS ON DISCHARGE BEHAVIOR AND ARGON LASER OPERATION  
REPT.-2  
N66-29240

**AHMED, S. A.**  
HIGH CURRENT DISCHARGE EFFECT ON MAGNETICALLY CONFINED ARGON LASER  
A67-10012

**AKANAYEV, B. A.**  
RAMAN GENERATOR FOR AMPLIFICATION AND GENERATION OF COHERENT RADIATION  
N67-11314

**AKHMANOV, S. A.**  
LIGHT FREQUENCY MULTIPLIERS FOR NONLINEAR OPTICAL EFFECTS AT VARIOUS WAVELENGTHS, CONSIDERING FOCUSING, LASER BEAM FINITE DIVERGENCE, AIR BREAKDOWN, STIMULATED RAMAN EMISSION, ETC  
A66-26146

PARAMETRIC AMPLIFIERS AND LASERS  
A66-28358

STATISTICAL EFFECTS DURING GENERATION OF SECOND HARMONIC IN OPTICALLY TRANSPARENT CRYSTALS, NOTING COEFFICIENT OF CORRELATION BETWEEN HARMONIC AND FUNDAMENTAL RADIATION POWER OF SOLID STATE LASER  
A66-31167

CONSISTENT THEORY OF NONLINEAR OPTICAL EFFECTS IN

- BOUNDED LIGHT BEAMS BY EXTENDING PARABOLIC EQUATIONS TO NONLINEAR PROBLEMS  
A66-41095
- STATISTICAL EFFECTS DURING GENERATION OF SECOND HARMONIC IN OPTICALLY TRANSPARENT CRYSTALS, NOTING COEFFICIENT OF CORRELATION BETWEEN HARMONIC AND FUNDAMENTAL RADIATION POWER OF SOLID STATE LASER  
A67-12928
- PARAMETRIC AMPLIFIERS AND LASERS  
A67-16361
- RAMAN GENERATOR FOR AMPLIFICATION AND GENERATION OF COHERENT RADIATION  
N67-11314
- AKIMOV, A. I.  
MICRO- AND MACROCRACK FORMATION IN ORGANIC GLASS BY FOCUSING OF LASER BEAM  
A67-18808
- AKITT, D. P.  
118-MICRON WAVELENGTH WATER VAPOR GAS LASER WITH 4-INCH DIAMETER TWO-METER FOCAL LENGTH MIRROR RESONATOR SYSTEM  
A66-29010
- AKSELRAD, A.  
LASER CAVITY OUTPUT OPTIMIZATION FOR MAXIMUM EXTERNAL QUANTUM EFFICIENCY SHOWING DEPENDENCE ON LENGTH AND REFLECTIVITY FOR GIVEN CURRENT DENSITY  
A66-31535
- ALCOCK, A. J.  
ELECTRON DENSITY IN LASER-INDUCED SPARK IN AIR DETERMINED, MEASURING SIMULTANEOUSLY FUNDAMENTAL LASER WAVELENGTH AND SECOND HARMONIC  
A66-28685
- TEMPERATURE MEASUREMENTS OF LASER SPARKS FROM RELATIVE INTENSITY OF X-RAY FLUX TRANSMITTED THROUGH BERYLLIUM FOILS OF DIFFERENT THICKNESS  
A66-40421
- ALEKSANDROV, A. P.  
DEGREE OF EXCITATION OF METASTABLE STATE DETERMINED, USING LUMINESCENCE SATURATION PHENOMENON, CALCULATING POPULATION OF WORKING LEVEL OF LASER SUBSTANCE  
A66-30846
- ALEKSANDROV, E. B.  
FREQUENCY SHIFT IN RESONANCE TRANSITION INDUCED IN POTASSIUM VAPOR BY RUBY LASER PULSE  
A66-25103
- FREQUENCY SHIFT IN RESONANCE TRANSITION INDUCED IN POTASSIUM VAPOR BY RUBY LASER PULSE  
A66-30282
- ALEKSEENKO, Z. T.  
SUBMILLIMETER WAVELENGTH ELECTRONIC DEVICES, EXAMINING DEVELOPMENT OF LASERS AND REFLECTED WAVE TUBES WITH OVERLAPPING EFFECTIVE WAVE RANGE  
A66-38004
- SUBMILLIMETER WAVELENGTH ELECTRONIC DEVICES, EXAMINING DEVELOPMENT OF LASERS AND REFLECTED WAVE TUBES WITH OVERLAPPING EFFECTIVE WAVE RANGE  
A67-17168
- ALEKSEEV, A. I.  
STEADY STATE REGIME OF ELECTROMAGNETIC OSCILLATION IN LASER  
A66-27065
- STEADY STATE REGIME OF ELECTROMAGNETIC OSCILLATION IN LASER  
A66-40824
- ALI, A. W.  
ION LASER EXPERIMENTS, MOLECULAR NITROGEN LASER, AND GAS LASER THEORY  
N67-12649
- ALKEMADE, C. TH. J.  
RESONATOR Q-MODULATION TECHNIQUE OBSERVATION OF CENTRAL DIP TUNING IN MODULATED POWER OUTPUT OF GAS LASER WITH MOVING MIRROR  
A67-18758
- ALLEN, L.  
ONSET OF OSCILLATION IN HE- NE LASER ANALYZED USING LAMB THEORY, OBTAINING TIME CONSTANT VALUE FOR POPULATION OF LOWER LASER LEVEL  
A67-16821
- ALLEY, C. O.  
RESEARCH REPORTS ON PHYSICS OF LASER RADIATION, OPTICAL RADAR SYSTEMS, CORNER REFLECTOR ON LUNAR SURFACE, PHOTON CORRELATIONS AND COUNTING STATISTICS, AND COLD CATHODES FOR GAS LASERS  
NASA-CR-81248 N67-16014
- ALLWOOD, M. J.  
CHORIORETINAL LESION PRODUCED BY PULSED RUBY LASER BEAM AND COMPLEX CHANGES IN RETINAL EXCITABILITY IN CATS  
A66-31761
- LASER LESIONS-CHANGES IN RETINAL EXCITABILITY IN CATS  
A66-81614
- ALPERT, S. S.  
HE- NE LASER HOMODYNE SPECTROMETER OBSERVATION OF BROADENING OF SPECTRAL PROFILE OF LIGHT SCATTERED FROM CARBON DIOXIDE NEAR CRITICAL TEMPERATURE AND DENSITY DUE TO DENSITY FLUCTUATIONS  
A66-26168
- ALSABROOK, C. M.  
MULTICOLOR LASER DISPLAY, DISCUSSING COMPONENTS AND FUTURE APPLICATION  
A66-35532
- ALTMAN, D. E.  
PULSED COAXIAL TRANSMISSION LINE NITROGEN GAS LASER, NOTING PRESSURE EFFECT  
A66-40107
- ALTSHULER, S.  
ATMOSPHERIC HEATING BY LASER PULSES IN TRANSMISSION WINDOWS  
TRW-4535-6003-R0-000 N66-34232
- AMBARTSUMIAN, R. V.  
TIME PARAMETERS OF POWERFUL LASER MEASURED WITH GA AS PHOTODIODE, NOTING TIME CONSTANT AND TIME RESOLUTION OF PHOTODIODE  
A66-27750
- PROPAGATION RATE OF HIGH POWER LASER LIGHT PULSE IN INVERSELY POPULATED MEDIUM  
A66-29980
- LASER ACTION WITH NONRESONANT FEEDBACK USING HIGH GAIN RUBY CRYSTALS  
A66-30297
- NONLINEAR AMPLIFICATION OF LIGHT PULSE PASSING THROUGH LASER OPERATING AT SATURATION REGIME  
A66-39542
- GIANT PULSE GENERATION RANGE IN TRANSVERSE DIRECTION AFTER Q-SWITCHING IN RUBY LASER, EXAMINING RESONATOR PROPERTIES  
A66-42516
- RUBY LASER WITH SCATTERING INDUCED FEEDBACK AND ABSENCE OF RESONANCE TYPE OSCILLATIONS  
A67-10740
- SHORT PULSE Q-SWITCHED LASER WITH VARIABLE PULSE LENGTH  
A67-16641
- RUBY LASER WITH NONRESONANT FEEDBACK DUE TO RADIATION SCATTERING, SHOWING USE AS OPTICAL FREQUENCY STANDARD  
A67-16642
- DYNAMICS OF NARROWING EFFECT OF SURFACE AND SPATIAL DISPERSING AGENTS ON RADIATION LINE OF RUBY LASER WITH NONRESONANCE FEEDBACK  
A67-18797
- ANANEV, IU. A.  
SINGLE PULSE OPERATION OF LASERS, NOTING ENERGY STORAGE AND AMPLIFICATION EFFECT FOR FOUR- AND THREE-LEVEL ACTIVE MEDIUM  
A66-39711
- ANDERSON, A. D.  
ION LASER EXPERIMENTS, MOLECULAR NITROGEN LASER, AND GAS LASER THEORY  
N67-12649
- ANDERSON, C. H.  
SOLID STATE CW OPTICALLY PUMPED MICROWAVE MASER, USING DIVALENT THULIUM DOPED CALCIUM FLUORIDE  
A66-33614
- ANDERSON, D. B.  
COHERENT OPTICAL TRANSDUCER FOR OPTICAL INFORMATION PROCESSING  
A66-31244

- ANDERSON, L. K.  
LOW NOISE PHOTODIODES WITH AVALANCHE  
MULTIPLICATION FOR HIGH SENSITIVITY, NOTING  
CAPABILITY FOR LOW INTENSITY WIDEBAND SIGNAL  
DETECTION, PERFORMANCE IN IR REGION, ETC  
A66-31934
- ANDERSON, P. H.  
RUBY LASER ENERGY REFLECTED OFF EXPLORER XXII  
SATELLITE A66-27054
- SATELLITE RANGE MEASUREMENTS USING LASER IN  
CONJUNCTION WITH PHOTOELECTRIC RECEIVER AND  
BAKER- NUNN CAMERA A66-29998
- PULSED RUBY LASER PHOTOELECTRIC RECEIVER  
EXPERIMENTS DETERMINING SATELLITE ORBITS,  
SUPPLEMENTING BAKER- NUNN CAMERA NETWORK  
A66-42547
- PHOTOGRAPHIC MEASUREMENT OF ENERGY DISTRIBUTION  
IN BEAM OF Q-SWITCHED RUBY LASER  
NASA-CR-75102 N66-26252
- RANGE MEASUREMENTS OF GEOS-I AND BE-C SATELLITES  
WITH RUBY LASER  
NASA-CR-77292 N66-34634
- ANDRADE, O.  
PASCHEN SERIES LASER LINES IN ATOMIC AND  
MOLECULAR HYDROGEN A66-40892
- ANDREEVA, T. L.  
GAS LASER OUTPUT AND THRESHOLD IN POPULATION  
INVERSION FROM PHOTODISSOCIATION OF METHYL IODIDE  
AND FLUOROiodo METHYLIDYNE A66-35368
- ANDRESEN, H. G.  
ATOMIC BEAM PREPARATION TECHNIQUES FOR HYDROGEN  
MASER OPERATION WITH UNPOLARIZED ATOMS  
ECOM-2720 N66-38178
- HYDROGEN MASER BEHAVIOR UNDER COHERENT LOW  
FREQUENCY ZEEMAN TRANSITION EXCITATION  
ECOM-2706 N66-38236
- ANDRIIAKHIN, V. M.  
REGENERATIVE HELIUM-NEON LASER WITH AMPLIFICATION  
COEFFICIENT OF 1000 A66-29352
- REGENERATIVE HELIUM-NEON LASER WITH AMPLIFICATION  
COEFFICIENT OF 1000 A66-37357
- ANISIMOV, S. I.  
LASER RADIATION EFFECT ON METALS, NOTING  
DISINTEGRATION MECHANISM, INDENTATION FORMATION  
AND VAPOR FORMATION A66-39763
- ANTONYANTS, V. YA.  
OPTIMUM OPERATING CONDITIONS OF RUBY LASER QUANTUM  
GENERATOR WITH PASSIVE SHUTTER N66-37711
- ARECCHI, F. T.  
SINGLE-MODE LASER FIELD MODEL CONSISTING OF  
AMPLITUDE STABILIZED SINE WAVE WITH SLOWLY VARYING  
RANDOM PHASE PLUS STATIONARY NOISE FIELD  
A66-30127
- ACCURACY AND LIMIT ANALYSIS OF STATISTICAL  
DISTRIBUTION OF EM RADIATION FIELD BY  
PHOTOELECTRON COUNTING DISTRIBUTIONS FROM  
PHOTODETECTOR FOR SINGLE MODE LASER NEAR THRESHOLD  
A67-16624
- ARMSTRONG, J. A.  
CORRELATIONS AND INTENSITY FLUCTUATIONS IN LIGHT  
FROM INDIVIDUAL LASING AND NONLASING MODES OF CW  
GA AS LASER AND THRESHOLD NOISE CHANGE IN LASER  
EMISSION A66-26210
- INTENSITY NOISE IN MULTIMODE GA AS LASER EMISSION  
A66-32689
- LINE WIDTH OF WELL-STABILIZED LASER OPERATING FAR  
ABOVE THRESHOLD DETERMINED BY PHASE RANDOM  
FLUCTUATION, USING INTERFEROMETER  
A66-39394
- PICOSECOND LASER PULSE WIDTHS MEASUREMENT BY  
METHOD USING SPECIAL SYMMETRY PROPERTIES OF SECOND  
HARMONIC GENERATION AT GA AS CRYSTAL SURFACE  
A67-20097
- ARONOV, A. G.  
LINE WIDTH OF SEMICONDUCTOR LASER  
A66-33127
- ARONOWITZ, F.  
COUPLING BETWEEN OPPOSITELY DIRECTED TRAVELING  
WAVES IN HE- NE RING LASER IN FORM OF MUTUAL  
BACKSCATTERING OF ENERGY FROM EACH BEAM INTO  
DIRECTION OF OTHER A66-37778
- MODE COUPLING EFFECTS DUE TO SCATTERING IN  
TRAVELING WAVE HELIUM-NEON RING LASER  
NASA-CR-82490 N67-19096
- ARZT, V.  
PHASE AND AMPLITUDE FLUCTUATION OF GAS AND SOLID  
STATE LASERS, ACCOUNTING FOR NOISE CAUSED BY  
PUMPING, INCOHERENT DECAY, LATTICE VIBRATIONS AND  
ATOMIC COLLISIONS A67-14949
- ARZUMANOV, V. N.  
NEODYMIUM GLASS LASER TIME CHARACTERISTICS AND  
SPECTRAL CHANGES DURING CONVERSION TO TRAVELING  
WAVE LASER A67-18782
- ASAMI, S.  
GASEOUS LASER OUTPUT EXPRESSED IN SINGLE OR TWO-  
LINE OSCILLATIONS AS FUNCTION OF PUMPING RATES AND  
TRANSITION PROBABILITIES, CONSIDERING CONCEPT OF  
EQUIVALENT NETWORK A67-16979
- ASCOLI-BARTOLI, U.  
OPERATION OF Q-SWITCHING DEVICE BASED ON  
FARADAY EFFECT AND USED WITH RUBY LASER FOR  
APPLICATION TO PLASMA DIAGNOSTICS A66-36079
- PLASMA PRODUCTION BY FIRING GIANT PULSE LASER AT  
SOLID DEUTERIUM PELLET /ICE/, NOTING STRONG  
ANISOTROPY IN PLASMA OUTBURST A66-36595
- ASHKIN, A.  
SECOND HARMONIC GENERATION / SHG/ BY FOCUSED LASER  
BEAMS IN NONLINEAR CRYSTALS A66-29816
- PARAMETRIC OSCILLATOR THRESHOLD WITH SINGLE MODE  
OPTICAL MASERS AND OBSERVATION OF AMPLIFICATION IN  
LITHIUM NIOBATE A66-32716
- SECOND HARMONIC GENERATION OF LIGHT BY FOCUSED  
LASER BEAMS IN NONLINEAR CRYSTALS AT EXIT SURFACE  
A67-16640
- ASHKINADZE, B. M.  
DISINTEGRATION OF ALKALI HALIDE SINGLE CRYSTALS,  
POLYMERS AND GLASSES UNDER LASER RADIATION, NOTING  
PARAMETERS OF DISINTEGRATION REGION MAGNITUDE  
A66-34681
- LASER BEAM EFFECT ON HYDRODYNAMIC BEARINGS,  
DISCUSSING MICROCRACKS AND CRITICAL ENERGY,  
EXPLAINING BREAKDOWNS A66-41409
- POLYMETHYLMETHACRYLATE AND POLYSTYRENE EXPOSURE  
TO RUBY AND NEODYMIUM-GLASS LASER RADIATION,  
NOTING APPEARANCE OF EPR A67-10075
- DISINTEGRATION OF ALKALI HALIDE SINGLE CRYSTALS,  
POLYMERS AND GLASSES UNDER LASER RADIATION, NOTING  
PARAMETERS OF DISINTEGRATION REGION MAGNITUDE  
A67-14367
- ASKARIAN, G. A.  
AMPLIFICATION OF INTERACTION OF ATOMS AND OF  
PULSED OR PERIODIC COOLING OF TRANSPARENT MEDIA  
PRODUCED BY LASER BEAM, NOTING CHANGES IN KINETIC  
ENERGY OF ATOMS A66-26021
- FAST OVERLAP OF MICROWAVE RADIATION BY IONIZATION  
AUREOLE OF SPARK IN LASER BEAM A66-36719
- SIGNAL EXCITATION IN NEGATIVELY CHARGED ANTENNA  
ROD IN EFFECT OF UNFOCUSED LASER BEAM  
A66-42753

SIGNAL EXCITATION IN NEGATIVELY CHARGED ANTENNA  
ROD IN EFFECT OF UNFOCUSED LASER BEAM A67-10835

PUMPING MEDIUM POWER LASERS USING ARTIFICIAL  
METEORS TO PRODUCE INTENSE GAS GLOW IN COMPRESSION  
WAVE A67-17757

ASKARYAN, G. A.  
HALATION OF PHOTOIONIZATION OF LIGHT SPARK  
INVESTIGATED, USING SUPER HIGH FREQUENCY RADIO  
RADIATION, FOR RUBY LASER TT-66-61469 N66-34061

ASTAFEV, A. S.  
SURFACE EFFECT ON TEMPERATURE, I-V AND WATT-  
AMPERE CHARACTERISTICS OF P-N JUNCTION  
SEMICONDUCTOR INJECTION LASER DIODE AS COHERENT  
LIGHT SOURCE A67-10077

ATWOOD, J. G.  
SATURATION INDUCED OPTICAL NONRECIPROCITY IN  
HE- NE RING LASER PLASMA, ELIMINATING FREQUENCY  
LOCKING BY USING FARADAY EFFECT A66-42552

AUBRY, M.  
EFFECTS OF LASER ON GUINEA PIG COCHLEAR FUNCTION  
A66-82132

AULD, B. A.  
CONFIGURATIONS FOR REALIZATION OF MULTIPLE LASER  
LIGHT SCATTERING USING MICROWAVE ACOUSTIC WAVES  
AND TWO PORRO PRISMS A66-42636

AVIZONIS, P. V.  
RUBY LASER AMPLIFIER DYNAMICS, NOTING AMPLIFICATION  
IN ENERGY GAIN REGIMES AND CORRELATION TO  
THEORETICAL EQUATIONS A66-25049

H-2 STOKES RAMAN OSCILLATOR OPERATING AT 9755  
ANGSTROMS, FINDING PERFORMANCE AS EXPECTED OF  
LASER OSCILLATORS WITH BEAM INSTABILITY NOT  
DEVELOPED A67-12516

EXPANSION VELOCITY OF LUMINOUS FRONT OF PLASMA  
PLUME GENERATED BY GIANT PULSE LASER A67-13573

ELECTRON DENSITY, OPTICAL THICKNESS AND  
TEMPERATURE OF RUBY LASER-INDUCED CARBON PLASMA  
A67-16654

## B

BABCOCK, W. R.  
PARTICLE VELOCITY IN GAS PARTICLE TWO-PHASE NOZZLE  
EXPANSION USING GAS LASER AND FABRY-PEROT  
INTERFEROMETER FOR ROCKET ENGINE PROPULSION  
AIAA PAPER 66-522 A66-31500

BACHERT, H.  
SPECTRAL ANALYSIS OF EMISSION OF SPATIALLY  
SEPARATED SPOTS IN GA AS INJECTION LASERS  
A67-20185

BADALIAN, N. N.  
SPECTRAL AND TIME-DEPENDENT CHARACTERISTICS OF  
STIMULATED RADIATION FROM RUBY PULSE LASER, USING  
FABRY-PEROT ETALON IN FINE-STRUCTURE OBSERVATION  
A66-39823

BADZIAK, W.  
CALORIMETER USING ENAMELED COPPER WIRE WITH  
VARIABLE RESISTANCE FOR MEASURING LASER ENERGY AND  
OUTPUT POWER A67-13536

BAGAEV, V. S.  
GA AS SEMICONDUCTOR QUANTUM GENERATOR HEATING  
DURING INJECTION PULSE, ANALYZING TEMPERATURE  
EFFECT ON EXTERNAL QUANTUM OUTPUT AND GENERATOR  
EFFICIENCY A66-41621

BAGAYEV, S. N.  
MULTIMODALITY OF GAS LASER IN RESONATOR WITH  
ONE DIRECTION TRAVELING WAVE PROPAGATION  
N67-11315

BAIN, W. C.  
UPPER ATMOSPHERIC LIGHT SCATTERING OF VERTICALLY  
FIRED RUBY-LASER PULSE A66-33348

BAKER, C. E.  
LARGE SCREEN REAL TIME PROJECTION DISPLAY  
TECHNIQUE USING NE- HE GAS LASER A66-31412

BAKUT, P. A.  
RADIO LOCATION BY COHERENT LIGHT WITH QUANTUM  
STRUCTURE A67-13283

BALASHOV, I. F.  
SINGLE PULSE OPERATION OF LASERS, NOTING ENERGY  
STORAGE AND AMPLIFICATION EFFECT FOR FOUR- AND  
THREE-LEVEL ACTIVE MEDIUM A66-39711

BALLARD, G. S.  
HOLOGRAM MEASUREMENTS OF OPTICALLY INHOMOGENEOUS  
FIELD BY PULSED LASER NASA-CR-82463 N67-19271

BALLIK, E. A.  
TEMPERATURES, LORENTZIAN WIDTHS AND DRIFT  
VELOCITIES OF EXCITED NEUTRAL AND IONIC SPECIES IN  
ARGON-ION LASER, NOTING THERMAL EQUILIBRIUM  
ACHIEVEMENT A66-28695

ACTUAL LINE SHAPE EXPECTED FROM ACCELERATING  
RADIATING ION, ERRORS DUE TO LORENTZIAN  
APPROXIMATION AND RESULTS FOR ION LASER TRANSITION  
IN RARE GAS LASERS A66-30181

BALZARINI, D.  
HE- NE LASER HOMODYNE SPECTROMETER OBSERVATION OF  
BROADENING OF SPECTRAL PROFILE OF LIGHT SCATTERED  
FROM CARBON DIOXIDE NEAR CRITICAL TEMPERATURE AND  
DENSITY DUE TO DENSITY FLUCTUATIONS A66-26168

BARANOVA, A. M.  
MINIMUM SPECTRAL LINE WIDTH, THRESHOLD CURRENT  
DENSITY, RADIATION-PEAK DISPLACEMENT AND POSSIBLE  
RECOMBINATION MECHANISM FOR GA SB LASER DIODE P-N  
JUNCTIONS IN COHERENT RADIATION A66-31764

MINIMUM SPECTRAL LINE WIDTH, THRESHOLD CURRENT  
DENSITY, RADIATION-PEAK DISPLACEMENT AND POSSIBLE  
RECOMBINATION MECHANISM FOR GA SB LASER DIODE P-N  
JUNCTIONS IN COHERENT RADIATION A67-10085

BARKHODAROVA, T. M.  
SPATIAL DISTRIBUTION OF ELECTRICAL FIELD OBTAINED  
BY FOCUSING RADIATION OF RUBY LASER A66-25967

BARNARD, T. W.  
DIGITAL-MODE FM CW LASER RANGING AND TRACKING  
SYSTEM USING COMPOUND AXIS SERVOMECHANISM  
A66-25982

BARNETTE, D.  
RING LASER SENSOR PARAMETERS AND CHARACTERISTICS,  
NOTING APPLICATION TO MEASUREMENT OF ANGULAR RATE,  
MASS FLOW, NAVIGATION AND GUIDANCE A66-35533

BARRON, P. P.  
OPTICAL SURFACE ROUGHNESS MEASUREMENT USING  
COHERENT RADIATION PRODUCED BY HELIUM-NEON LASER  
SIGMA-POLARIZED AT 6328 ANGSTROMS A67-10020

BARTELL, L. S.  
SCATTERING OF ELECTRON BEAM BY STANDING WAVES OF  
PHOTONS INSIDE LASER CAVITY CORRESPONDS TO  
STIMULATED COMPTON EFFECT A66-26155

BARYNIN, V. A.  
GAS DISCHARGE BY LASER PULSE, TAKING INTO ACCOUNT  
PHOTOIONIZATION DUE TO ELECTRON IMPACT A66-41094

BASOV, N. G.  
GALLIUM ARSENIDE P-N JUNCTION LASER DIODE,  
INJECTION CURRENT DISTRIBUTION, DENSITY AND



- EMISSION SPECTRA VARIATION A66-25934
- Q-SWITCHED LASERS, INTERACTION OF HIGH POWER LIGHT PULSE WITH MATTER AND SEMICONDUCTOR LASERS PUMPED WITH OPTICAL RADIATION AND ELECTRON BEAMS INVESTIGATED, USING QUANTUM OSCILLATOR AND AMPLIFIER A66-26180
- PERIODIC UNDAMPED OSCILLATIONS IN POWER INTENSITY OF TWO-MODE OPTICAL MASER A66-26217
- LIGHT PULSE SHAPE VARIATION OF LASER WITH MODULATED Q-FACTOR DURING NONLINEAR AMPLIFICATION A66-27183
- SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION A66-27187
- TIME PARAMETERS OF POWERFUL LASER MEASURED WITH GA AS PHOTODIODE, NOTING TIME CONSTANT AND TIME RESOLUTION OF PHOTODIODE A66-27750
- OPTICALLY CONNECTED LASER CONSTRUCTED ON GALLIUM ARSENIDE P-N JUNCTION, NOTING COHERENT RADIATION A66-28262
- HYDROGEN ATOM BEAM CHARACTERISTICS, DISCUSSING SIGNAL POWER, GENERATING FREQUENCY, RADIATION SIGNAL DAMPING AND HYDROGEN ATOM RELAXATION TIME A66-28289
- PROPAGATION RATE OF HIGH POWER LASER LIGHT PULSE IN INVERSELY POPULATED MEDIUM A66-29980
- LASER ACTION WITH NONRESONANT FEEDBACK USING HIGH GAIN RUBY CRYSTALS A66-30297
- INDIUM ARSENIC ANTIMONIDE SINGLE CRYSTALS IN P-N JUNCTION LASER A66-31767
- GENERATION IN CADMIUM SULFIDE DURING TWO-PHOTON OPTICAL EXCITATION BY RUBY LASER WITH MODULATED Q-FACTOR A66-33134
- LASER BASED ON EXCITATION OF GALLIUM PHOSPHORUS ARSENIDE SOLID SOLUTION BY BEAM OF FAST ELECTRONS A66-33304
- MODE CHARACTERISTICS OF SOLID STATE LASERS FROM ANALYTICAL SOLUTION OF CONSERVATIVE EQUATION A66-33839
- GALLIUM ARSENIDE LASER EXCITATION BY FAST ELECTRONS A66-35760
- GALLIUM ARSENIDE LASERS OPERATING AT ROOM TEMPERATURE INVESTIGATED, BASED ON DIFFUSION P-N JUNCTIONS, DISCUSSING EMISSION SPECTRUM A66-36070
- TWO-LASER CAVITY IN TANDEM TO RESOLVE COMPONENTS WITH HOMOGENEOUSLY BROADENED / DOPPLER/ LINE A66-36720
- NONLINEAR INTERACTION OF OSCILLATIONS OF TWO TYPES IN LASER DOES NOT EFFECT STATIONARY OPERATION WHEN OSCILLATIONS ARE SUFFICIENTLY APART IN BAND A66-37661
- PERFORMANCE OF GA AS SEMICONDUCTOR LASER WITH RESONATOR, NOTING DEPENDENCE OF FORBIDDEN ZONE WIDTH AND ABSORPTION COEFFICIENT ON FREE CARRIER CONCENTRATION AND INCIDENT PHOTON ENERGY A66-38955
- HIGH FREQUENCY-STABILITY EM WAVE SOURCE, APPLYING THERMAL EXCITATION METHODS TO PENCIL QUANTUM GENERATOR IN IR REGION A66-39336
- NONLINEAR AMPLIFICATION OF LIGHT PULSE PASSING THROUGH LASER OPERATING AT SATURATION REGIME A66-39542
- HIGH FREQUENCY-STABILITY EM WAVE SOURCE, APPLYING THERMAL EXCITATION METHODS TO PENCIL QUANTUM GENERATOR IN IR REGION A66-39706
- GIANT PULSE GENERATION RANGE IN TRANSVERSE DIRECTION AFTER Q-SWITCHING IN RUBY LASER, EXAMINING RESONATOR PROPERTIES A66-42516
- LIGHT PULSE SHAPE VARIATION OF LASER WITH MODULATED Q-FACTOR DURING NONLINEAR AMPLIFICATION A66-42727
- SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION A66-43085
- INDIUM PHOSPHIDE BASED SEMICONDUCTOR LASER AMPLIFICATION, LOSS FACTOR AND RADIATION PATTERN A67-10065
- THRESHOLD AND POWER CHARACTERISTICS OF GALLIUM ARSENIDE DIODE LASER OPERATING IN PULSED REGIME A67-10066
- CURRENT INJECTION EFFECT ON TIME DELAY OF GA AS LASER RADIATION A67-10083
- INDIUM ARSENIC ANTIMONIDE SINGLE CRYSTALS IN P-N JUNCTION LASER A67-10087
- RUBY LASER WITH SCATTERING INDUCED FEEDBACK AND ABSENCE OF RESONANCE TYPE OSCILLATIONS A67-10740
- LASER BASED ON EXCITATION OF GALLIUM PHOSPHORUS ARSENIDE SOLID SOLUTION BY BEAM OF FAST ELECTRONS A67-11824
- MODE CHARACTERISTICS OF SOLID STATE LASERS FROM ANALYTICAL SOLUTION OF CONSERVATIVE EQUATION A67-13208
- HEATING AND SCATTERING OF PLASMA PRODUCED BY GIANT LASER PULSE FOCUSED ON SOLID TARGET A67-14194
- PERFORMANCE OF GA AS SEMICONDUCTOR LASER WITH RESONATOR, NOTING DEPENDENCE OF FORBIDDEN ZONE WIDTH AND ABSORPTION COEFFICIENT ON FREE CARRIER CONCENTRATION AND INCIDENT PHOTON ENERGY A67-15759
- SHORT PULSE Q-SWITCHED LASER WITH VARIABLE PULSE LENGTH A67-16641
- RUBY LASER WITH NONRESONANT FEEDBACK DUE TO RADIATION SCATTERING, SHOWING USE AS OPTICAL FREQUENCY STANDARD A67-16642
- EQUATION FOR DYNAMICAL BEHAVIOR OF LASER, SOLVING CASE OF DEEP MODULATION OF OUTPUT, NOTING PULSATION PROBLEMS A67-16662
- SEMICONDUCTOR LASERS WITH RADIATING MIRRORS DEVELOPED BY EXCITATION, USING ELECTRON BEAM AND NEODYMIUM LASER GLASS RADIATION A67-16669
- SEMICONDUCTOR LASERS USING SINGLE AND DOUBLE PHOTON OPTICAL EXCITATION A67-18930
- SEMICONDUCTOR GALLIUM-ARSENIDE LASER WITH FLAT RESONATOR N66-36291
- THERMALLY EXCITED INFRARED BEAM LASER USING CARBON DIOXIDE, NITROGEN OXIDE, AND HYDROCYANIC ACID MOLECULAR ENERGY LEVELS ATD-66-102 N67-15769
- BATEMAN, D. A.  
U V RADIATION GENERATION FROM OUTPUT OF ND GLASS LASER BY FREQUENCY DOUBLING IN AMMONIUM DIHYDROGEN PHOSPHATE CRYSTALS A67-18712
- BATEMAN, D. A.  
ENERGY AND POWER OF Q-SWITCHED NEODYMIUM GLASS LASER MEASURED, USING CALORIMETRIC DEVICES, VACUUM PHOTODIODES, ETC A66-34904
- BATIFOL, E.  
BEATING OF OSCILLATING FREQUENCIES CORRESPONDING TO TWO DIRECTIONS OF TRAVEL OF ANNULAR CAVITY LASER WITH ACTIVE GAS MEDIUM IN MOVEMENT A66-43007

- EMISSION FROM TELLURIUM SINGLE CRYSTAL PUMPED BY TWO WAVES FROM CARBON DIOXIDE LASER  
A67-14914
- DRAW EFFECT OF GAS RING LASER ACTIVE MEDIUM  
NASA-TT-F-10693  
N67-18935
- BAYLEY, D. S.  
CESIUM VAPOR USED FOR TRANSFORMER LASER TO BE OPTICALLY PUMPED BY BATTERY OF NEODYMIUM LASERS  
GPL-A-31-3  
N66-33813
- BECKER, A. G.  
SPECTROSCOPY OF LITHIUM FLUORIDE CRYSTALS ACTIVATED WITH URANIUM TRIOXIDE FOR LASER ACTION, SHOWING ANOMALOUS FLUORESCENT DECAY UNDER HIGH INTENSITY PUMPING  
A66-25997
- BECKER, C. H.  
COHERENT LIGHT RECORDING/REPRODUCING TECHNIQUES BASED ON DEBYE THEORY OF COHERENT LIGHT SOURCE FOCUSING  
A66-25541
- UNIDENSITY COHERENT LIGHT PROCESSING SYSTEM / UNICON/  
A67-11034
- BECKER, G.  
TUNING OF AMMONIA BEAM MASER RESONATOR BASED ON FREQUENCY SHIFT METHOD, NOTING HYSTERESIS APPEARANCE AND ELIMINATION  
A66-31696
- BECKER, J.  
LASER DAMAGE OF THIN FILMS - ENERGY DENSITY THRESHOLDS DETERMINED FOR SINGLE QUARTERWAVE AND HALF-WAVE FILMS VACUUM EVAPORATED ON GLASS AND QUARTZ SUBSTRATES  
AD-633554  
N66-34015
- BEDIER, J. C.  
REPLACING HEATED TUNGSTEN FILAMENT AND IR FILTER BY GaAs ELECTROLUMINESCENT DIODE WITHOUT FILTER FOR IR ILLUMINATION  
A66-36266
- BEGIASHVILI, G. A.  
EFFECTIVE LIFETIME OF EXCITED STATE OF GAS LASER, WITH ACCOUNT OF NEAR PHOTON TRANSFER  
A66-27135
- BEISER, L.  
PERSPECTIVE RENDERING OF FIELD INTENSITY DIFFRACTED AT CIRCULAR APERTURE WITH REFERENCE TO LASER-SCANNING TECHNIQUE  
A66-28843
- EXTREMELY WIDEBAND INFORMATION STORAGE AND RETRIEVAL SYSTEMS EMPLOYING LASER OR ELECTRON BEAM ON SILVER HALIDE OR ELECTRON BEAM ON THERMOPLASTIC FILM  
A67-11437
- BEKEFI, G.  
THREE-MIRROR LASER INTERFEROMETER MEASURING ELECTRON DENSITIES IN REPETITIVELY PULSED PLASMAS  
A67-11875
- BELENOV, E. M.  
TRAVELING WAVE BEATS CREATED BY RING LASER ON ROTATING PLATFORM, NOTING FREQUENCY DIVISION ROTATING RATE AND CAPTURE BAND PARAMETERS  
A66-25102
- COUPLING AND SYNCHRONIZATION OF LASERS, NOTING FIELD AMPLITUDES, DELAYED INTERACTION AND DIELECTRIC CONSTANT DISPERSION  
A66-29885
- TRAVELING WAVE BEATS CREATED BY RING LASER ON ROTATING PLATFORM, NOTING FREQUENCY DIVISION ROTATING RATE AND CAPTURE BAND PARAMETERS  
A66-30281
- BELIANIN, V. A.  
TREATMENT OF STEEL WITH LASER BEAM, OBTAINING PRECISION HOLES WITHOUT AFFECTING MICROHARDNESS OF METAL  
A67-18234
- BELIKOVA, T. P.  
RUBY PHOTOCONDUCTIVITY WHEN EXPOSED TO LASER IRRADIATION, NOTING OSCILLOGRAMS  
A66-33941
- BELL, C. E.  
TIME RESOLVED AND TIME INTEGRATED MEASUREMENTS OF PLASMA PRODUCED BY Q-SWITCHED LASER BEAM FOCUSED ON SURFACE OF METALLIC SOLID  
NOLTR-66-96  
N67-17906
- BELL, W. E.  
HIGH RESOLUTION PIEZOELECTRICALLY SCANNED FABRY-PEROT INTERFEROMETER USED TO STUDY GAIN PROFILES, MODE STRUCTURES AND EMISSION LINE WIDTHS OF CW AR, KR AND Xe ION LASERS AND HG-HE PULSED LASER  
A66-26208
- PULSED TOROIDAL EXCITATION OF GAS ION LASERS EXTENDED TO DRIVE HIGH POWER CW LASER TRANSITIONS IN AR, KR, CL AND BR, NOTING OPERATING PARAMETERS AND POWER OUTPUT  
A66-28877
- BELOSTOTSKII, B. R.  
TEMPERATURE FIELD OF ACTIVE MEDIUM OF PULSED LASER USING VARIATIONAL METHODS, CONSIDERING TWO APPROXIMATE SOLUTIONS  
A67-16935
- BENEDEK, G. B.  
VELOCITY AND LIFETIME OF MICROWAVE THERMAL PHONONS IN LIQUIDS AND SOLIDS DETERMINED BY SPECTRUM OF LIGHT SCATTERING FROM LASER ILLUMINATED SAMPLE  
A66-26166
- BENEDETTI-MICHELANGELI, G.  
OPERATION OF Q-SWITCHING DEVICE BASED ON FARADAY EFFECT AND USED WITH RUBY LASER FOR APPLICATION TO PLASMA DIAGNOSTICS  
A66-36079
- BENNETT, W. R., JR.  
TEMPERATURES, LORENTZIAN WIDTHS AND DRIFT VELOCITIES OF EXCITED NEUTRAL AND IONIC SPECIES IN ARGON-ION LASER, NOTING THERMAL EQUILIBRIUM ACHIEVEMENT  
A66-28695
- ACTUAL LINE SHAPE EXPECTED FROM ACCELERATING RADIATING ION, ERRORS DUE TO LORENTZIAN APPROXIMATION AND RESULTS FOR ION LASER TRANSITION IN RARE GAS LASERS  
A66-30181
- ABSOLUTE DIRECT EXCITATION CROSS SECTION FROM NEUTRAL GROUND STATE FOR UPPER LEVELS OF TRANSITION IN ARGON LASER  
A67-12520
- BENZ, K.-W.  
TIME VARIATION IN INTENSITY OF LIGHT EMITTED FROM CW GaAs LASER DIODES  
A67-10243
- BEREZHIINSKII, L. I.  
OPTICAL METHODS AND EQUIPMENT USED IN CHECKING SURFACE FINISH AND VOLUME AND SURFACE INHOMOGENEITIES OF ACTIVE MEDIA AND INTERFEROMETRIC MIRRORS OF LASERS  
A67-13143
- BERGQVIST, T.  
BREAKDOWN BY NEODYMIUM GLASS LASER RADIATION IN ATOMIC AND MOLECULAR GASES, DETERMINING POWER DENSITIES, NOTING RELATION OF PRESSURE TO BREAKDOWN POWER  
A66-30938
- BERNAL G., E.  
POSITIVE ION EMISSION FROM TUNGSTEN SURFACES LASER IRRADIATED STUDIED, USING TIME-OF-FLIGHT SPECTROMETER  
A67-16651
- BERNAL, E.  
PARTICLE EMISSION FROM SURFACE INTERACTING WITH LASER BEAM  
A67-12180
- BERNARD, M.  
LASER ACTION IN GALLIUM ANTIMONIDE DIODES, EXAMINING EMITTED LIGHT SPECTRUM VS INJECTED CURRENT, TEMPERATURE EFFECT, RADIATIVE EFFICIENCY, ETC  
A66-26184
- BERNE, A.  
SINGLE-MODE LASER FIELD MODEL CONSISTING OF AMPLITUDE STABILIZED SINE WAVE WITH SLOWLY VARYING RANDOM PHASE PLUS STATIONARY NOISE FIELD  
A66-30127

ACCURACY AND LIMIT ANALYSIS OF STATISTICAL

- DISTRIBUTION OF EM RADIATION FIELD BY PHOTOELECTRON COUNTING DISTRIBUTIONS FROM PHOTODETECTOR FOR SINGLE MODE LASER NEAR THRESHOLD  
A67-16624
- BERNSTEIN, H. L.  
THERMAL HIGH RESOLUTION RECORDING USING MOVING LASER SPOT ON METALLIC AND ORGANIC THIN FILMS  
A67-16586
- BEROZASHVILI, I. U. N.  
GA AS SEMICONDUCTOR QUANTUM GENERATOR HEATING DURING INJECTION PULSE, ANALYZING TEMPERATURE EFFECT ON EXTERNAL QUANTUM OUTPUT AND GENERATOR EFFICIENCY  
A66-41621
- BERRINGER, L. D.  
ATOMIC TIME STANDARDS, DESCRIBING CESIUM BEAM STANDARD, AMMONIA MASER AND GAS-CELL TYPE CLOCKS  
A66-35468
- BERRY, W. B.  
CHANGE IN BASIC BARRIER RELATION FOR HETEROJUNCTION COMPARED TO HOMOJUNCTION OF WIDE GAP EMITTER INJECTION LASER  
A67-17097
- BERSHTEIN, I. L.  
PHASE RELATIONS OF LONGITUDINAL MODES IN GAS LASER WITH ANNULAR RESONATOR  
A66-37663
- BERTOLOTI, M.  
FIRST AND SECOND ORDER CORRELATION FUNCTIONS FOR FIELD OBTAINED BY SUPERPOSITION OF TWO LASER MODES THROUGH YOUNGS EXPERIMENT, USED TO DETERMINE COHERENCE AND STATISTICAL PROPERTIES  
A67-12634
- BESPALOV, V. I.  
AUTOMODULATION OF EMISSION FROM SOLID STATE LASER  
A66-26041
- FREQUENCY SPECTRUM OF LASER IMPULSE IN Q-SWITCHING REGIME WIDER THAN THAT OF SINGLE IMPULSE RADIATED BY LASER IN ORDINARY REGIME  
A66-37141
- SOLID LASER RADIATION OPERATING IN Q-SWITCHED RESONATOR REGIME NOTING EFFECT OF FINITE RATE OF SWITCHING, FINITENESS OF RELAXATION TIME, TRANSMISSION COEFFICIENT FACTOR, ETC  
A66-37142
- FREQUENCY DOUBLING OF LASER LIGHT WITH VARIABLE Q-SWITCHED RESONATOR  
A66-39654
- PERIODIC AUTOMODULATION OF RADIATION AND POSSIBILITY OF GENERATING GIANT PULSES IN THREE-LEVEL LASER WITH INHOMOGENEOUSLY EXCITED ACTIVE MEDIUM  
A67-17233
- BESSE, A. L.  
TWMAN- GREEN ARRANGEMENT OF INTERFEROMETER WITH NARROW LASER BEAM AND TWIN PHOTOMULTIPLIERS, EXAMINING STRONG SHOCKS IN ARGON IN 15.2 CM SHOCK TUBE  
A67-12688
- BESSHAPOSHNIKOV, A. A.  
MEASURING DEVICE FOR PULSED LASER OUTPUT POWER USING BOLTOMETER, AMPLIFIER AND OSCILLOSCOPE  
A66-29701
- BESSON, J.  
INDIUM ARSENIDE LASERS AND HG TE- CD TE PHOTODETECTORS WITH VERY FAST TIME CONSTANTS FOR IR SPECTRAL BAND  
A66-36268
- SEMICONDUCTOR LASERS AND FAST IR DETECTORS, DISCUSSING IN AS, IN SB AND THREE TYPES OF MERCURY CADMIUM TELLURIDE DETECTORS  
A67-16668
- BETEROV, I. M.  
DECAY CROSS SECTION OF PUMPED METASTABLE HE ATOMS IN HE- NE LASER  
A66-34695
- DECAY CROSS SECTION OF PUMPED METASTABLE HE ATOMS IN HE NE LASER  
A67-10511
- BICEVSKIS, I.  
PHASE-LOCKING SCHEME FOR FREQUENCY-STABILIZED GAS LASER OSCILLATORS  
NASA-CR-80958  
N67-14893
- BICKART, C. J.  
EFFECTS AND PARAMETERS INFLUENCING OPTICAL PATH LENGTH WITHIN PUMPING PROCESS IN RUBY AND DOPED GLASS LASER RODS  
A66-31443
- INTERFEROMETRIC PHOTOGRAPHIC TECHNIQUES FOR RECORDING OPTICAL PATH LENGTH VARIATIONS IN PUMPED LASER RODS  
ECOM-2751  
N67-14331
- BILLINGS, B. H.  
PHOTOGRAPHIC COPIES OF HOLOGRAMS TAKEN WITH LASER LIGHT NOTING FILM, LIGHT SOURCE, DIRECTIONAL EFFECT, PROCESSING, ETC  
A66-26000
- BIRAUD, S.  
PERTURBATION OF RUBY LASER BY VIBRATING ONE OF MIRRORS CONSTITUTING RESONANT CAVITY  
A66-42999
- BIRNBAUM, M.  
SEGMENTED-ROD RUBY LASER STRUCTURE OPERATED AS GIANT PULSE LASER, USING KERR CELL TO PROVIDE Q-SWITCHING, NOTING NUMBER OF OSCILLATING MODES  
A66-25038
- MIRROR DAMAGE ALLEVIATION IN GIANT PULSE SEMICONDUCTOR LASER OPERATION, DISCUSSING USE OF HIGH MELTING POINT MIRRORS COOLING AND OBLIQUE INCIDENCE  
A66-38245
- Q-SWITCHED LASER OPERATION OBSERVED USING LIQUID SELENIUM MIRROR AS REFLECTOR IN RUBY LASER MEASURING REFLECTIVITY CHANGES  
A67-16679
- BISS, R. E.  
ION CURRENT PRODUCED BY ILLUMINATING MATERIALS WITH FOCUSED OUTPUT OF PULSED RUBY LASER  
NASA-CR-54154  
N66-28382
- BIVAS, R.  
TOPOCENTRIC DISTANCE OF GEODETIC SATELLITE GEOS-A MEASURED BY LASER TELEMETRY FROM STATION  
A66-30586
- BJORKHOLM, J. E.  
OPTICAL NONLINEARITIES MEASURED BY GAUSSIAN LASER BEAM  
ML-1405  
N66-39487
- BLANC, J.  
DEUTERIUM ISOTOPE EFFECT ON THRESHOLDS OF EUROPIUM CHELATE LASERS, NOTING SOLVENT THERMAL EFFECTS  
A66-26598
- BLINOV, L. M.  
PHOTO EMF VARIATION WITH RADIATION POWER OF Q-SWITCH RUBY LASER INCIDENT ON SILICON CRYSTAL WITH P-N JUNCTION  
A66-32509
- BLOEMBERGEN, N.  
NONLINEAR SUSCEPTIBILITY DESCRIBING SECOND HARMONIC GENERATION OF LIGHT MEASURED IN SEMICONDUCTORS WITH ZINC-BLENDE SYMMETRY, USING QUANTUM MECHANICS AND LASER WAVELENGTH  
A66-26149
- SECOND HARMONIC GENERATION BY Q-SWITCHED LASER PULSE FROM SILICON AND GERMANIUM SURFACES  
A66-26150
- COUPLED WAVE FORMALISM, GIVING UNIFIED DESCRIPTION OF PARAMETRIC DOWN CONVERSION OF LIGHT, STIMULATED BRILLOUIN AND RAMAN EFFECTS, ETC, STRESSING EXPONENTIAL CHARACTER OF GAIN  
A66-26156
- BLOOM, A. L.  
HIGH RESOLUTION PIEZOELECTRICALLY SCANNED FABRY-PEROT INTERFEROMETER USED TO STUDY GAIN PROFILES, MODE STRUCTURES AND EMISSION LINE WIDTHS OF CW AR, KR AND XE ION LASERS AND HG- HE PULSED LASER  
A66-26208
- GAS-DISCHARGE CW LASERS, PARTICULARLY HE- NE,

- CARBON DIOXIDE, ARGON-ION AND PULSED SELF-TERMINATING LASERS, DISCUSSING CLASSIFICATION, POWER OUTPUT AND GAIN, DOPPLER WIDTH, COHERENCE AND NOISE A66-42801
- PRESSURE- AND GAIN-DEPENDENT FREQUENCY SHIFT MEASUREMENTS IN STABILIZED 6328 ANGSTROM HE- NE LASER A66-42803
- BLOOMQUIST, J. C.**  
AVALANCHE TRANSISTOR PULSER DESIGNED TO DRIVE GA AS RADAR-LASER DIODE A67-12964
- BOARD, K.**  
VAPORIZATION OF THIN METALLIC FILMS WITH FOCUSED LASER BEAM, COMPARING THEORETICAL AND EXPERIMENTAL RESULTS PREPARED BY USING PULSED HIGH PRESSURE HELIUM-NEON LASER A67-15478
- BOCEK, V.**  
INTERFERENCE MEASUREMENT OF HOMOGENEITY OF RUBY RESONATOR FOR LASER FTD-TT-66-44 N67-11161
- BOCKASTEN, K.**  
PASCHEN SERIES LASER LINES IN ATOMIC AND MOLECULAR HYDROGEN A66-40892
- BOERSCH, H.**  
ELECTRON DENSITIES IN HELIUM PLASMA MEASURED BY LASER AMPLIFIER WITH MAXIMUM GAIN AND MINIMUM BANDWIDTH AT POINT NEAREST THRESHOLD A67-16663
- BOGATYREV, IU. K.**  
SOLID LASER RADIATION OPERATING IN Q-SWITCHED RESONATOR REGIME NOTING EFFECT OF FINITE RATE OF SWITCHING, FINITENESS OF RELAXATION TIME, TRANSMISSION COEFFICIENT FACTOR, ETC A66-37142
- FREQUENCY DOUBLING OF LASER LIGHT WITH VARIABLE Q-SWITCHED RESONATOR A66-39654
- BOGDANKEVICH, O. V.**  
LOCAL LASER HEATING OF CATHODE FOR ELECTRON EXTRACTION FROM PLASMOID A66-29879
- LASER BASED ON EXCITATION OF GALLIUM PHOSPHORUS ARSENIDE SOLID SOLUTION BY BEAM OF FAST ELECTRONS A66-33304
- GALLIUM ARSENIDE LASER EXCITATION BY FAST ELECTRONS A66-35760
- PERFORMANCE OF GA AS SEMICONDUCTOR LASER WITH RESONATOR, NOTING DEPENDENCE OF FORBIDDEN ZONE WIDTH AND ABSORPTION COEFFICIENT ON FREE CARRIER CONCENTRATION AND INCIDENT PHOTON ENERGY A66-38955
- LASER BASED ON EXCITATION OF GALLIUM PHOSPHORUS ARSENIDE SOLID SOLUTION BY BEAM OF FAST ELECTRONS A67-11824
- PERFORMANCE OF GA AS SEMICONDUCTOR LASER WITH RESONATOR, NOTING DEPENDENCE OF FORBIDDEN ZONE WIDTH AND ABSORPTION COEFFICIENT ON FREE CARRIER CONCENTRATION AND INCIDENT PHOTON ENERGY A67-15759
- SEMICONDUCTOR LASERS WITH RADIATING MIRRORS DEVELOPED BY EXCITATION, USING ELECTRON BEAM AND NEODYMIUM LASER GLASS RADIATION A67-16669
- LASER ACTION IN ZINC SELENIDE CRYSTALS AT 4600 ANGSTROMS PREPARED UNDER HIGH PRESSURE IN CLOSED CONTAINER BY GAS PHASE REACTION AND FOLLOWING CRYSTALLIZATION A67-20183
- SEMICONDUCTOR GALLIUM-ARSENIDE LASER WITH FLAT RESONATOR N66-36291
- BOGDANOVSKAYA, L. A.**  
PROBABILITY METHOD OF DETERMINING ENERGY LOSSES IN RUBY LASER WITH MISALIGNED RESONATORS FTD-HT-66-492 N67-19235
- BOGEN, P.**  
FARADAY ROTATION MEASUREMENT OF TRAPPED MAGNETIC FIELDS IN THETA PINCH PLASMA, USING GAS LASER BEAM A67-17447
- BOIKO, V. A.**  
HEATING AND SCATTERING OF PLASMA PRODUCED BY GIANT LASER PULSE FOCUSED ON SOLID TARGET A67-14194
- BOKUT, B. V.**  
SUM RADIATION FREQUENCY GENERATION BY RUBY AND NEODYMIUM LASERS IN KDP CRYSTALS A67-19734
- BOLWIJN, P. T.**  
DEPENDENCE OF ZEEMAN BEAT FREQUENCY ON INTERFEROMETER TUNING IN SINGLE-MODE HE- NE LASER WITH VARIOUS GAS PRESSURES AND MAGNETIC FIELD STRENGTHS A66-26201
- SINGLE MODE OUTPUT POWER MODULATION ANALYSIS OF SATURATION AND GAIN OF GAS LASERS AND EFFECTS OF EXCITATION DENSITY MODULATION AND RESONATOR Q MODULATION A67-15111
- SINGLE MODE OUTPUT POWER MODULATION STUDY OF SATURATION AND GAIN OF GAS LASER A67-16686
- RESONATOR Q-MODULATION TECHNIQUE OBSERVATION OF CENTRAL DIP TUNING IN MODULATED POWER OUTPUT OF GAS LASER WITH MOVING MIRROR A67-18758
- BONAMY, J.**  
FRACTION OF LUMINOUS ENERGY CAPTURED BY OPTICAL PUMPING LASERS IN GIVEN GEOMETRICAL CONFIGURATION, OBTAINING FUNCTIONING THRESHOLD DEPENDING ONLY ON CRYSTAL A67-15498
- BONCH-BRUEVICH, A. M.**  
FREQUENCY SHIFT IN RESONANCE TRANSITION INDUCED IN POTASSIUM VAPOR BY RUBY LASER PULSE A66-25103
- FREQUENCY SHIFT IN RESONANCE TRANSITION INDUCED IN POTASSIUM VAPOR BY RUBY LASER PULSE A66-30282
- RESONANT BIREFRINGENCE IN POTASSIUM VAPOR UNDER INFLUENCE OF ELECTRIC FIELD OF RUBY LASER EMISSION A66-36066
- LASER RADIATION EFFECT ON METALS, NOTING DISINTEGRATION MECHANISM, INDENTATION FORMATION AND VAPOR FORMATION A66-39763
- NEODYMIUM GLASS LASER TIME CHARACTERISTICS AND SPECTRAL CHANGES DURING CONVERSION TO TRAVELING WAVE LASER A67-18782
- NEODYMIUM GLASS LASER WITH SPHERICAL MIRROR RESONATOR IN STATIONARY REGIME A67-18783
- BONCHKOVSII, V. I.**  
RUBY LASER EXPERIMENT YIELDING GIANT PULSES BY SEPARATING MIRRORS FROM CRYSTALS A66-25684
- BOND, R. A.**  
AVALANCHE TRANSISTOR PULSER DESIGNED TO DRIVE GA AS RADAR-LASER DIODE A67-12964
- BOND, R. L.**  
HOLOGRAM MEASUREMENTS OF OPTICALLY INHOMOGENEOUS FIELD BY PULSED LASER NASA-CR-82463 N67-19271
- BONDARENKO, A. N.**  
RUBY LASER-INDUCED EFFECT OF PULSED PRESSURE ON KDP CRYSTAL SURFACE AND THERMAL BULK EFFECT ON EXCITATION OF ULTRASONIC OSCILLATION IN CRYSTAL A66-40318
- BOORNARD, A.**  
LASER RADIATION TO DETERMINE ELECTRON DENSITY IN DENSE HIGH TEMPERATURE PLASMA A66-27507
- LASER MEASUREMENT OF ELECTRON DENSITY IN DENSE,

- HIGH TEMPERATURE PLASMA N67-13686
- BOOTH, P. L.  
TRAVELING WAVE MASER FOR RADIO ASTRONOMY  
INTERFEROMETER NOTING SUPERCONDUCTING MAGNET,  
DYNAMO AND CRYOSTAT A67-20115
- BORDOGNA, J.  
VOICE COMMUNICATIONS SYSTEM USING GA AS ROOM-  
TEMPERATURE INJECTION LASER AND TV COMMUNICATIONS  
SYSTEM USING GA AS CRYSTALS AS MODULATORS FOR  
LASER BEAMS A67-11786
- BOROVICH, B. L.  
LASER OPERATED WITH SATURABLE FILTER FOR Q-  
SWITCHING, NOTING TWO MODES OF EXCITATION /SOFT  
AND HARD REGIME/ A66-32314
- BORRELLI, N. F.  
DAMAGE IN GLASS INDUCED BY LINEAR ABSORPTION OF  
LASER RADIATION NON- Q-SPOILED A67-16794
- BORTFELD, D. P.  
STIMULATED EMISSION OF POLYMETHINE DYES UPON  
PUMPING WITH Q-SWITCHED LASER, NOTING WAVELENGTH  
PARAMETERS AND OSCILLATION A66-42247
- BOTTOMS, P. J.  
THERMALIZATION RATE OF HIGHLY IONIZED PLASMA WITH  
INITIALLY HOT IONS AND COLD ELECTRONS, USING LASER  
SCATTERING TO OBSERVE TIME VARIATION OF ELECTRON  
TEMPERATURE A67-10912
- BOUSKY, S.  
DATA RECORD AND READOUT SYSTEMS DEPENDENCE ON  
PRECISE SPOT AND LINE SCAN METHODS, USING  
DIFFRACTION LIMITED SPOTS OF LASER GENERATED LIGHT  
A67-15321
- BOWE, P. W.  
ABSORBER RELAXATION EFFECT ON PASSIVE Q-SWITCH  
PULSE LASER A66-27029
- BOWEN, J. R.  
C W ARGON ION LASER SCATTERING IN ARGON PLASMA,  
NOTING RESONANCE AND CORRELATION BETWEEN DATA AND  
PLASMA PROPERTIES A67-16665
- BOWMAN, C. E.  
LASER FOR PHOTOELASTICITY INCLUDING SCATTERED-  
LIGHT METHOD, CONVENTIONAL TRANSMISSION  
POLARISCOPE WITH STATIC LOADS AND DYNAMIC  
PHOTOELASTICITY A66-32072
- BOYD, G. D.  
SECOND HARMONIC GENERATION / SHG/ BY FOCUSED LASER  
BEAMS IN NONLINEAR CRYSTALS A66-29816
- PARAMETRIC OSCILLATOR THRESHOLD WITH SINGLE MODE  
OPTICAL MASERS AND OBSERVATION OF AMPLIFICATION IN  
LITHIUM NIOBATE A66-32716
- SECOND HARMONIC GENERATION OF LIGHT BY FOCUSED  
LASER BEAMS IN NONLINEAR CRYSTALS AT EXIT SURFACE  
A67-16640
- BRADBURY, R. A.  
MEASUREMENTS ON PHYSICAL AND LASER PROPERTIES OF  
VAPOR-GROWN RUBY SINGLE CRYSTALS PREPARED BY  
EPITAXIAL GROWTH A66-36081
- BRADFORD, J. N.  
Q-SPOILING OF RUBY LASER BY OPTICAL PUMPING IN  
INTENSE INHOMOGENEOUS MAGNETIC FIELD WITH  
REDUCED GAIN A67-12505
- MAGNETIC LOW TEMPERATURE Q-SWITCHING OF RUBY  
LASER N67-12648
- BRADLEY, D. J.  
INTERNAL SELF-DAMAGE IN 25 MW RUBY LASER  
OSCILLATOR ROD A66-41160
- RUBY LASER GIANT PULSE OFF-AXIAL MODES DETECTED  
WITH HIGH RESOLUTION SPHERICAL FABRY- PEROT  
INTERFEROMETER A66-41627
- INTENSITY DEPENDENT FREQUENCY SHIFT IN SPECTRAL  
OUTPUT OF MONOCHROMATIC GIANT PULSE LASERS
- MEASURED, USING FABRY- PEROT INTERFEROMETER  
A67-10251
- BRADLEY, J.  
THERMALLY TUNED RUBY LASER RADAR FOR DETERMINING  
VERTICAL PROFILE OF ATMOSPHERIC WATER VAPOR  
TR-66-9 N66-35539
- BRAENDLI, H. P.  
THRESHOLD DETERMINATION OF PULSED RUBY LASER BY  
SINGLE PULSE TECHNIQUE A66-37548
- BRAERMAN, W. F.  
LANGMUIR PROBE USE FOR ELECTRON TEMPERATURE  
DETERMINATION IN LASER-INDUCED PLASMA  
BRL-MR-1715 N66-28920
- BRAIN, O. V.  
LASER BEAM EFFECT ON BENZENE AND OTHER ORGANIC  
COMPOUNDS, NOTING FORMATION OF DARK READILY  
COAGULATING DEPOSIT A67-17028
- BRANDEWIE, R. A.  
HIGH POWER CARBON DIOXIDE LASER HETERODYNE  
DETECTION OF BEATS AND LINEWIDTH MEASUREMENTS  
A67-17891
- BRECHER, C.  
PHYSICAL PROPERTIES AND OPERATING CHARACTERISTICS  
OF EUROPIUM AND RARE EARTH CHELATE LASERS  
TR-66-052.13 N67-12533
- BREECE, R. C.  
C AT DETECTION FROM DOPPLER SHIFT IN LASER LIGHT  
BACKSCATTERED FROM ATMOSPHERIC AEROSOL A66-28930
- DOPPLER LASER RADAR SYSTEM FOR DETECTION OF CLEAR  
AIR TURBULENCE  
SID-66-450 N66-35122
- BREHM, B.  
TUNABLE LASER BEAM FOR INVESTIGATING HIGHLY  
EXCITED STATES OF ATOMS IN DISCHARGE N66-36881
- BRET, G.  
RAMAN LIGHT FORWARD EMISSION IN LIQUIDS WHEN  
ILLUMINATED BY LASER, OBTAINING STIMULATED RAMAN  
ACTION WITHOUT FEEDBACK, WHICH SUGGESTS EXISTENCE  
OF MECHANISM CONTRIBUTING TO MODULATION OF MEDIUM  
POLARIZABILITY A66-26160
- BRET, G. G.  
STIMULATED RAMAN EFFECT IN ACETONE AND ACETONE-  
CARBON DISULFIDE MIXTURES, NOTING SIMILARITY OF  
STOKES RADIATION PATTERN TO RAMAN EFFECT  
A66-28881
- BREWER, R. G.  
MULTIPLE STIMULATED BRILLOUIN EMISSION EXHIBITED  
BY LIQUIDS EXPOSED TO PULSED RUBY LASER, NOTING  
SCATTERING EVENTS, STOKES ORDERS IDENTIFICATION  
AND ITERATION MECHANISM A66-26164
- BRICKS, B. G.  
FARADAY EFFECT AS SWITCHING TECHNIQUE FOR HIGH  
POWER LASER OUTPUT N67-12651
- BRIDGE, W. J.  
POLARIZATION OF LIGHT SCATTERED FROM HE- NE LASER  
BEAM, APPLYING QUANTUM THEORY TO FORMULA FOR  
DEPOLARIZATION RATIO A67-15624
- BRIDGES, T. J.  
COMPETITION, HYSTERESIS AND REACTIVE Q-SWITCHING  
IN CARBON DIOXIDE LASERS AT 10.6 MICRONS, USING  
MOVING MIRROR TECHNIQUE A66-41631
- BRIENZA, M. J.  
CONTINUOUSLY VARIABLE OPTICAL DELAY LINE USING  
ACOUSTIC WAVES TO DIFFRACT AND FREQUENCY SHIFT  
PORTION OF ARGON ION LASER BEAM A67-12517
- BRISH, A. A.  
LEAD AZIDE AND PENTAERYTHRIT TETRANITRATE  
EXPLOSION TRIGGERED BY LASER RADIATION  
A67-19315

- BRODIN, M. S.**  
LASER-GENERATION-TYPE LUMINESCENCE CD S- CD SE  
CRYSTALS EXPOSED TO DOUBLE PHOTON EXCITATION FROM  
RUBY LASER A66-27647
- SELF-FOCUSING OF RUBY LASER BEAM IN NA CL  
CRYSTALS A67-12481
- FRACTURE MECHANISM OF TRANSPARENT CRYSTALS  
INTERACTING WITH RUBY LASER BEAM A67-13128
- LUMINESCENCE IN CADMIUM SULFIDE MIXED CRYSTALS OF  
WIDELY VARYING COMPOSITION IN PRESENCE OF  
EXCITATION BY RUBY LASER EMISSION A67-13153
- BROOKNER, E.**  
SYSTEM DESIGN ANALYSIS OF LASER METHODS OF DEEP  
SPACE COMMUNICATION, EXAMINING LOCAL HETERODYNE  
SYSTEM / LHS/, DIRECT DETECTION SYSTEM / DDS/ AND  
TRANSMITTED REFERENCE SYSTEM A66-35666
- SYSTEM DESIGN ANALYSIS OF LASER METHODS OF DEEP  
SPACE COMMUNICATION, EXAMINING LOCAL HETERODYNE  
SYSTEM / LHS/, DIRECT DETECTION SYSTEM / DDS/ AND  
TRANSMITTED REFERENCE SYSTEM A67-17635
- BROOKS, R. E.**  
PULSED LASER HOLOGRAPH AND PROBLEM OF  
OVERCOMING LIMITED COHERENCE A66-42560
- BROUBE, V. L.**  
RUBY LASER OPERATION WITH INCLINED MIRRORS  
N67-17170
- BROUDE, V. L.**  
TIME CHARACTERISTICS IN GENERATION OF GIANT LASER  
PULSE STUDIED BY CIRCUIT WITH PRISMATIC SHUTTERS  
A66-29702
- TUNABLE DISPERSION RESONATOR AND BROADENING OF  
LASER EMISSION SPECTRAL RANGE TO OBTAIN OPERATING  
FREQUENCY OTHER THAN FUNDAMENTAL A67-13131
- BROWN, D. R.**  
ENERGY AND POWER OF Q-SWITCHED NEODYMIUM GLASS  
LASER MEASURED, USING CALORIMETRIC DEVICES,  
VACUUM PHOTODIODES, ETC A66-34904
- BROWN, M. E.**  
AVALANCHE TRANSISTOR PULSER DESIGNED TO DRIVE  
GA AS RADAR-LASER DIODE A67-12964
- BROWN, M. A. C. S.**  
INDIUM ARSENIDE DIODE LASER FABRICATION USING  
LIQUID PHASE EPITAXY, NOTING QUANTUM EFFICIENCY  
A67-17096
- BROWN, P., JR.**  
SAFETY PROGRAM FOR LASER HAZARDS, DISCUSSING EYE  
AND BODY PROTECTION A67-19089
- BROWN, R. T., JR.**  
LASER BACKSCATTER SIGNATURES AND TRANSMISSIVITY  
OVER HORIZONTAL AND SLANT PATHS WITH RESPECT TO  
MEASURING EXTINCTION COEFFICIENTS OF SCATTERING  
MEDIA A67-14677
- BROWN, T. E.**  
CEREBRAL CORTEX OF DOG AS AFFECTED BY LASER  
RADIATION A66-82035
- BROWN, W. P., JR.**  
SELECTIVE ACCESS LASER DISPLAY BEAM POSITIONER  
RADC-TR-66-447 N67-15327
- BRUCE, C.**  
ELECTRON DENSITY, OPTICAL THICKNESS AND  
TEMPERATURE OF RUBY LASER-INDUCED CARBON PLASMA  
A67-16654
- BRUCE, C. W.**  
LASER INDUCED PLASMA DENSITY MEASUREMENT USING  
MULTIPLE BEAM INTERFEROMETRY A66-41630
- BUECKNER, K. A.**  
LINEAR INSTABILITY OF LASER PROPAGATION IN FLUID  
WITH COUPLING BETWEEN LIGHT AND MEDIUM A66-35034
- BRUN, P.**  
FRACTION OF LUMINOUS ENERGY CAPTURED BY OPTICAL  
PUMPING LASERS IN GIVEN GEOMETRICAL CONFIGURATION,  
OBTAINING FUNCTIONING THRESHOLD DEPENDING ONLY ON  
CRYSTAL A67-15498
- BRUNET, H.**  
HIGH RESOLUTION SPECTROSCOPY USING ZEEMAN-TUNED  
IR MASER OSCILLATING AT TRANSITIONS BETWEEN 3 AND  
9 MICRONS A67-16633
- BRYANT, J. F.**  
OPTICAL EMISSION FROM RUBY INDUCED BY SHORT  
PULSES OF RELATIVISTIC ELECTRONS IN WHICH  
ELECTRON-HOLE RECOMBINATION PRODUCES EXCITATION OF  
EMISSION A66-26173
- BUBE, R. H.**  
LASER SATURATION OF PHOTOCONDUCTIVITY AND  
DETERMINATION OF IMPERFECTION PARAMETERS IN  
SENSITIVE PHOTOCONDUCTORS SUCH AS SINGLE CRYSTAL  
OF CADMIUM A67-11879
- BUCK, W. E.**  
OPTICAL BEAM DEFLECTION TECHNIQUE USING  
INTERFEROMETER CAVITY ILLUMINATED BY GAS LASER  
BEAM A66-28689
- BUCKINGHAM, A. D.**  
POLARIZATION OF LIGHT SCATTERED FROM HE- NE LASER  
BEAM, APPLYING QUANTUM THEORY TO FORMULA FOR  
DEPOLARIZATION RATIO A67-15624
- BUCKLEY, J.**  
LARGE APERTURE TELESCOPE FOR USE AS COHERENT  
OPTICAL DEEP SPACE COMMUNICATIONS RECEIVER  
NASA-CR-81677 N67-17946
- BUDIN, J. P.**  
TIME EVOLUTION OF LASER INDUCED FRACTURES IN  
GLASS, NOTING CRACK PROPAGATION ACCOMPANIED BY  
SPARKING A67-12508
- BUINOV, G. N.**  
RELATION BETWEEN LASER PARAMETERS AND CATHODE  
DIAMETER IN EXCITATION OF HE- NE MIXTURE BY  
DISCHARGE OF HOLLOW CYLINDER A66-29357
- RELATION BETWEEN LASER PARAMETERS AND CATHODE  
DIAMETER IN EXCITATION OF HE- NE MIXTURE BY  
DISCHARGE OF HOLLOW CYLINDER A66-37361
- BUIOCCHI, C. J.**  
DISLOCATIONS AND PRECIPITATES IN GA AS INJECTION  
LASERS REVEALED BY NEW A-B ETCHANT A66-31071
- BULABOIS, J.**  
FREQUENCY SHIFT RELATIVE TO SPECTRAL WIDTH FOR  
SINGLE PULSES OF TRIGGERED LASER DETERMINED BY  
MEASURING VARIATIONS OF EMITTED WAVELENGTH AS  
FUNCTION OF TIME A66-32622
- BULAMACCHI, P.**  
SINGLE-MODE LASER FIELD MODEL CONSISTING OF  
AMPLITUDE STABILIZED SINE WAVE WITH SLOWLY VARYING  
RANDOM PHASE PLUS STATIONARY NOISE FIELD A66-30127
- BURGEAT-MENGUY, B.**  
EFFECTS OF LASER ON GUINEA PIG COCHLEAR FUNCTION  
A66-82132
- BURGEAT, M.**  
EFFECTS OF LASER ON GUINEA PIG COCHLEAR FUNCTION  
A66-82132
- BURGESS, T. J.**  
DOPPLER SHIFT AND HIGH VELOCITY MIRROR  
TRANSLATION EFFECTS ON MUTUAL OPTICAL COHERENCE  
FUNCTION OF GAS LASER MICHELSON INTERFEROMETERS  
A66-35387
- BURLAMACCHI, P.**  
HELIUM-NEON LASER EMISSION ON 6401 ANGSTROM LINE,  
NOTING INTENSITY VS MIRROR SHIFT AND OPTICAL

## C

- CAVITY INSTABILITY A66-26336
- POWER ENHANCEMENT IN PULSED HE- NE LASERS, NOTING  
OVERSHOOTING FOR RF DISCHARGE MODULATION WITH  
SQUARE WAVE A66-32963
- ACCURACY AND LIMIT ANALYSIS OF STATISTICAL  
DISTRIBUTION OF EM RADIATION FIELD BY  
PHOTOELECTRON COUNTING DISTRIBUTIONS FROM  
PHOTODETECTOR FOR SINGLE MODE LASER NEAR THRESHOLD  
A67-16624
- ENHANCED LASING OF HIGH PRESSURE HE- NE LASER,  
COMMENTING ON DELAY TIME OF LIGHT PULSE EMITTING  
THROUGH WALLS OF DISCHARGE TUBE FROM START OF  
EXCITING PULSE A67-16687
- BURRELL, G. J.  
SPONTANEOUS EMISSION AND TRANSVERSE GAIN  
MEASUREMENTS IN GA AS INJECTION LASER AT 80  
DEGREES K AND FOR 8466 ANGSTROM WAVELENGTH  
A66-28627
- TRANSVERSE GAIN AND SPONTANEOUS AND STIMULATED  
EMISSION AT 8466 ANGSTROMS IN GA AS STRUCTURES  
A66-42561
- BURROWS, W. G.  
TROPOSPHERIC PROPAGATION USING LASER AS  
TRANSMITTER, ANALYZING EFFECTS OF BENARD CELLS,  
TURBULENCE, WIND SHEAR, ETC A66-42367
- BURSAKOV, E. S.  
RELATION BETWEEN LASER PARAMETERS AND CATHODE  
DIAMETER IN EXCITATION OF HE- NE MIXTURE BY  
DISCHARGE OF HOLLOW CYLINDER A66-29357
- RELATION BETWEEN LASER PARAMETERS AND CATHODE  
DIAMETER IN EXCITATION OF HE- NE MIXTURE BY  
DISCHARGE OF HOLLOW CYLINDER A66-37361
- BUSCHER, H. T.  
THRESHOLD DATA FOR RUBY AND NEODYMIUM LASER  
PULSE-INDUCED BREAKDOWN IN XE, AR, KR, NE,  
HE, OXYGEN, NITROGEN, AIR AND CARBON DIOXIDE  
A66-26191
- BUSER, R. G.  
LASER PUMPING BY INTENSE NOBLE GAS DISCHARGE IN  
ZETA-PINCH GEOMETRY A66-25995
- BUTLER, J. F.  
SPONTANEOUS AND COHERENT EMISSION FROM LEAD  
SULFIDE, TELLURIDE AND SELENIDE DIODE LASERS IN  
ORIENTED MAGNETIC FIELD, DETERMINING BAND EDGE  
PARAMETERS FROM SPIN-SPLIT ZERO ORDER LANDAU  
LEVEL TRANSITIONS A66-26185
- BUTTON, K. J.  
MULTIPLE CYCLOTRON RESONANCE ABSORPTION LINES IN  
DEGENERATE VALENCE BANDS OF GE SEMICONDUCTOR  
STUDIED WITH FAR IR LASER SUBMILLIMETER  
SPECTROMETER A66-42545
- BUTYLKIN, V. S.  
TWO-PHOTON LASER EXCITATION CONDITIONS  
DETERIORATED BY PRESENCE OF RESONATOR TUNED ON  
TRANSITION FREQUENCY BETWEEN OPERATING LEVELS OF  
MATTER A66-37143
- FREQUENCY DOUBLING IN RESONANCE LASER, OBTAINING  
SECOND HARMONIC FIELD FOR LASER RADIATION BY GIANT  
PULSES A66-37144
- BYER, R. L.  
HIGH RESOLUTION PIEZOELECTRICALLY SCANNED FABRY-  
PEROT INTERFEROMETER USED TO STUDY GAIN PROFILES,  
MODE STRUCTURES AND EMISSION LINE WIDTHS OF CW  
AR, KR AND XE ION LASERS AND HG- HE PULSED  
LASER A66-26208
- BYKOV, V. P.  
THEORETICAL OPTICAL RESONATOR FOR LASER WITH RARE  
EARTH LIQUID SOLUTIONS AS ACTIVE COMPONENTS  
A66-39549
- CABANNES, F.  
OPTICAL TRANSMISSION OF PLASMA COLUMN GENERATED BY  
IONIZED GAS EXPLOSION DETERMINED, USING LASER BEAM  
A66-42998
- CABEZAS, A. Y.  
OPTICAL LENGTH VARIATIONS IN LASER AMPLIFIERS  
DETERMINED DURING PUMPING AND AMPLIFICATION, USING  
INTERFEROMETRY A66-25999
- SPECTRAL HOLE BURNING AND CROSS RELAXATION EFFECTS  
ON STEADY STATE GAIN SATURATION OF LASER AMPLIFIER  
WITH INHOMOGENEOUSLY BROADENED LINEWIDTH  
A66-40098
- CAGNARD, R.  
LASER OSCILLATOR STUDY OF COHERENT STIMULATED  
EMISSION OF IR TRANSITIONS IN RARE GASES  
A66-27336
- CALAWA, A. R.  
SPONTANEOUS AND COHERENT EMISSION FROM LEAD  
SULFIDE, TELLURIDE AND SELENIDE DIODE LASERS IN  
ORIENTED MAGNETIC FIELD, DETERMINING BAND EDGE  
PARAMETERS FROM SPIN-SPLIT ZERO ORDER LANDAU  
LEVEL TRANSITIONS A66-26185
- CAMPANELLA, S. J.  
DATA RECORDING AND PROCESSING SYSTEMS FOR GT-7  
LASER COMMUNICATOR EXPERIMENT - LASER WAVE  
SCATTERING DUE TO REFRACTIVE INDEX PERTURBATIONS  
IN PROPAGATING MEDIUM  
NASA-CR-65553 N66-39966
- CAMPBELL, C. J.  
RETINAL LESIONS PRODUCED BY RUBY LASER IN RABBITS  
AND HUMANS A66-82224
- CAPET, M.  
INITIAL PULSE IN LUMINOUS EMISSION OF DISCHARGE  
LASER, USING PHOTOMULTIPLIER PRECEDED BY MOBILE  
IRIS, DETERMINING GEOMETRICAL DISTRIBUTION OF  
DISCHARGE BRIGHTNESS A66-31209
- CARLETON, H. R.  
MODULATION BY ULTRASONIC DIFFRACTION OF 10.6  
MICRON LASER RADIATION IN PHOTOELASTIC CD S,  
GA AS AND SI CRYSTALS A66-39112
- CARLSON, C. O.  
THERMAL HIGH RESOLUTION RECORDING USING MOVING  
LASER SPOT ON METALLIC AND ORGANIC THIN FILMS  
A67-16586
- CARMAN, R. L.  
DEGENERATE STIMULATED FOUR-PHOTON INTERACTION AND  
FOUR-WAVE PARAMETRIC AMPLIFICATION OBSERVED IN  
RUBY LASER AND LIQUID CELL ARRANGEMENTS  
A67-16379
- CARPENTIER, M. H.  
OPTICAL TECHNIQUES IN LASER DETECTION SYSTEMS  
A66-37439
- CARR, W. M.  
PHOTOMETRIC FIGURES OF MERIT FOR VARIOUS SHAPED  
SEMICONDUCTOR LUMINESCENT SOURCES OPERATING IN  
SPONTANEOUS MODE A66-27495
- CARROLL, T. O.  
DOUBLE RESONANCE EFFECTS EXTENDED TO CASE OF  
STIMULATED EMISSION IN EXCITED STATES OF NEON,  
USING GAS LASER IN TRANSVERSE DC MAGNETIC FIELD  
A67-16645
- CARSON, J. W.  
DYNAMIC OPTICAL PROPERTIES OF LASER MATERIALS  
P66-134 N66-35125
- CARSWELL, A. I.  
LASER STUDIES AT RCA VICTOR RESEARCH  
LABORATORIES, MONTREAL, DISCUSSING  
SPECTROSCOPIC, INTERFEROMETRIC AND PLASMA  
DIAGNOSTIC RESEARCH A67-19082
- CARVER, T. R.  
OSCILLATION CONDITIONS FOR FEEDBACK LASERS,  
SUPERRADIANT DIRECTIONALLY COHERENT EMISSION  
LASERS AND COHERENCE BRIGHTENED EMISSION LASERS

- A66-32628
- CASEY, H. C., JR.  
SUPERRADIANCE IN N-TYPE GALLIUM ARSENIDE AT ROOM  
TEMPERATURE EXCITED BY ELECTRON BEAM A66-27028
- CATHERIN, J.-M.  
NONRECIPROCAL EFFECTS ASSOCIATED WITH EXCITATION  
CURRENT OBSERVED IN D C-EXCITED HE- NE RING  
LASER, NOTING COUPLING PHENOMENA BETWEEN RIGHT  
AND LEFT WAVES A66-37408
- CAULFIELD, H. J.  
NEAR-FIELD DIFFRACTION OF HELIUM-NEON LASER AT  
CIRCULAR APERTURES A66-31727
- CERNICHIARI, O. M.  
FEASIBILITY OF USING FLUORESCING DYES PUMPED WITH  
RUBY LASER FOR LOWER THRESHOLDS THAN RAMAN TYPE  
LASERS AD-636953 N66-38187
- CESENA, R. A.  
OPTICAL EMISSION FROM RUBY INDUCED BY SHORT  
PULSES OF RELATIVISTIC ELECTRONS IN WHICH  
ELECTRON-HOLE RECOMBINATION PRODUCES EXCITATION OF  
EMISSION A66-26173
- EFFECTS OF SPACE RADIATION ON LASERS  
NASA-CR-79108 N66-39911
- CHABOT, A.  
TRAVELING WAVE RUBY LASER AS RADAR TRANSMITTER  
NOTING POWER GAIN, COHERENCE, FREQUENCY SHIFT AND  
SINGLE MODE OF OPERATION A67-16657
- CHAIKA, M. P.  
RADIATIVE POWER AMPLIFICATION OF HE- NE LASER  
WITH NEARLY CONFOCAL RESONATORS A66-41453
- RADIATIVE POWER AMPLIFICATION OF HE- NE LASER  
WITH NEARLY CONFOCAL RESONATORS A67-14190
- CHAKRAVARTI, A. N.  
FREQUENCY STABILITY AND SPECTRAL PURITY OF P-N  
JUNCTION LASER OUTPUT IMPROVED BY SYNCHRONIZATION  
WITH GAS LASER BEAM A66-29717
- VALENCE BAND SPIN-ORBIT SPLITTING IN HIGHLY  
DEGENERATE SEMICONDUCTORS DETERMINED FROM  
SPLITTING OF PEAK LASER DIODE EMISSION IN HIGH  
MAGNETIC FIELDS A66-36036
- CHALMETON, V.  
NONLINEAR DIELECTRIC LASER LIGHT ABSORPTION BY  
NEUTRAL GAS RESULTING IN AVALANCHE BREAKDOWN OF  
GAS DUE TO THERMAL IONIZATION A66-25425
- INITIAL PULSE IN LUMINOUS EMISSION OF DISCHARGE  
LASER, USING PHOTOMULTIPLIER PRECEDED BY MOBILE  
IRIS, DETERMINING GEOMETRICAL DISTRIBUTION OF  
DISCHARGE BRIGHTNESS A66-31209
- CHAMBERLAIN, R. G.  
LASER APPLICATION AS MEASURING EQUIPMENT IN METAL  
WORKING, DISCUSSING SURFACE-GRAZING  
INTERFEROMETER, FEEDBACK LASER DEVICE AND LENGTH  
MEASURING LASER ASME PAPER 66-MD-43 A66-38491
- CHAN, P. W.  
SCATTERING OF LIGHT FROM PULSED RUBY LASER BY  
PLASMA JET, NOTING CROSS SECTION, ELECTRON-PHONON  
INTERACTION, ETC A66-30139
- CHANG, R. K.  
NONLINEAR SUSCEPTIBILITY DESCRIBING SECOND  
HARMONIC GENERATION OF LIGHT MEASURED IN  
SEMICONDUCTORS WITH ZINC-BLENDE SYMMETRY, USING  
QUANTUM MECHANICS AND LASER WAVELENGTH A66-26149
- SECOND HARMONIC GENERATION BY Q-SWITCHED LASER  
PULSE FROM SILICON AND GERMANIUM SURFACES A66-26150
- CHANG, Z.-K.  
HIGH VOLTAGE PULSED ELECTRODELESS DISCHARGE IN  
RARE GAS AS LIGHT SOURCE FOR RUBY AND ND GLASS  
LASER EXCITATION AND OBSERVATION OF OUTPUT  
CHARACTERISTICS A66-31448
- CHANNING, D. A.  
U V RADIATION GENERATION FROM OUTPUT OF ND GLASS  
LASER BY FREQUENCY DOUBLING IN AMMONIUM DIHYDROGEN  
PHOSPHATE CRYSTALS A67-18712
- CHAPLYGIN, V. A.  
CONCENTRATION OF CHROMIUM IONS IN RUBY LASER  
CRYSTAL LATTICE DETERMINED FROM RADIATION OUTPUT  
CHARACTERISTICS N66-37712
- CHARLES, R. G.  
SPECTROSCOPIC, CHEMICAL AND LASER PROPERTIES OF  
PIPERIDINIUM SALT OF EUROPIUM TETRAKIS A66-43034
- CHARLIP, S.  
BIPOLAR NI- CD CELLS FOR RUBY LASERS AND POWER  
SOURCES TO YIELD HIGH ENERGY PULSES FOR FIRING  
PYROTECHNIC DEVICES A66-41760
- CHARLTON, T.  
LASER SYSTEM FOR MEASURING SURFACE CONTOURS IN  
LARGE STEERABLE ANTENNAS A66-34296
- CHARTIER, G.  
PERTURBATION OF RUBY LASER BY VIBRATING ONE OF  
MIRRORS CONSTITUTING RESONANT CAVITY A66-42999
- CHASTOV, A. A.  
Q-FACTOR MODULATION OF RUBY-LASER RESONATOR BY  
PHTHALOCYANINE SERIES A66-29353
- Q-FACTOR MODULATION OF RUBY-LASER RESONATOR BY  
PHTHALOCYANINE SERIES A66-37358
- CHATTERTON, E. J.  
COHERENT AND NONCOHERENT SEMICONDUCTOR LASERS FOR  
DEVELOPMENT OF FREQUENCY- AND PULSE-MODULATED  
COMMUNICATIONS SYSTEMS ESD-TDR-65-232 N66-25513
- CHAU, N. N.  
LASER LIGHT MODULATION BY POCKELS OR KERR EFFECT  
FOR APPLICATION TO TELECOMMUNICATIONS SYSTEM,  
EXAMINING ELECTRICAL BIREFRINGENCE MODULATION A66-36262
- CHAVCHANIDZE, D. N.  
EFFECTIVE LIFETIME OF EXCITED STATE OF GAS LASER,  
WITH ACCOUNT OF NEAR PHOTON TRANSFER A66-27135
- CHEBOTAEV, V. P.  
COMPETITION OF TRANSITIONS AND EMISSION IN HE- NE  
LASER, USING RESONATOR WITHOUT DISPERSING PRISM A66-33514
- DECAY CROSS SECTION OF PUMPED METASTABLE HE ATOMS  
IN HE- NE LASER A66-34695
- RADIATION FROM HIGH-ENERGY-LEVEL TRANSITIONS  
EXCITED IN HE- NE LASER DURING OPTICAL PUMPING  
WITH HE LAMP A66-34697
- COMPETITION OF TRANSITIONS AND EMISSION IN HE- NE  
LASER, USING RESONATOR WITHOUT DISPERSING PRISM A66-42127
- DECAY CROSS SECTION OF PUMPED METASTABLE HE ATOMS  
IN HE NE LASER A67-10511
- RADIATION FROM HIGH ENERGY LEVEL TRANSITIONS  
EXCITED IN HE- NE LASER DURING OPTICAL PUMPING  
WITH HE LAMP A67-10513
- REGENERATIVE RADIATION FROM NEON LINE IN HE- NE  
LASER, USING SPHERICAL REFLECTORS IN RESONATOR A67-13096
- CHECCACCI, P. F.  
EXPERIMENT WITH MICROWAVE OPEN RESONATOR OF  
FABRY- PEROT TYPE



- AFCRL-66-496  
TIME BEHAVIOR OF LIGHT EMITTED FROM MANY-ELEMENT LASER - MICROWAVE MODELS OF LASER RESONATORS ASR-1  
N67-10283
- CHELIDZE, T. IA.  
SHAPE AND DIMENSION OF SPARK ARISING DURING FOCUSING OF LASER EMISSION  
A66-29210
- SHAPE AND DIMENSION OF SPARK ARISING DURING FOCUSING OF LASER EMISSION  
A66-33059
- SPECTRAL ANALYSIS OF LASER DISCHARGE IN PURE AND IMPURE HE, OBTAINING SPECTRA OF SPARK AT VARIOUS PRESSURES, DETERMINING ELECTRON CONCENTRATION AT VARIOUS STAGES  
A66-40946
- CHEN, C. J.  
EXPERIMENTAL EVIDENCE OF INVERSE BREMSSTRAHLUNG AND ELECTRON-IMPACT IONIZATION IN LOW PRESSURE ARGON IONIZED BY GIANT PULSE LASER  
A66-29115
- PLASMA FLOW VELOCITY PROFILE MEASUREMENT BY ELECTROSTATIC PROBE DETECTION OF PLASMA DROP CAUSED BY GAS BREAKDOWN DUE TO FOCUSED GIANT PULSE LASER  
A66-38395
- CHEN, D.  
INTRACAVITY TIME-VARYING PERTURBATION OF LOSSES IN GAS LASER USING DIAMAGNETIC FARADAY EFFECT IN GLASSES ANALYZED IN CONNECTION WITH OUTPUT INTENSITY  
A67-16646
- CHEN, F. S.  
OPTICAL MODULATOR USING ELECTRO-OPTIC EFFECT IN LITHIUM TANTALATE FOR PCM TRANSMISSION SYSTEMS OPERATING AT 224 MEGACYCLE BIT RATE  
A67-10013
- CHENG, Y. F.  
CONTINUOUS WAVE GAS LASER AS LIGHT SOURCE IN SCATTERED LIGHT STATIC PHOTOELASTICITY  
A66-37443
- CHEO, P. K.  
THRESHOLD STUDIES OF ION LASER OSCILLATIONS IN SULFUR AND SATURATION AND QUENCHING OF LASER INTENSITY  
A66-26209
- CHERKASOV, E. M.  
OPTICAL MASER OSCILLATION LINES IN HF DISCHARGE IN MIXTURE OF AR AND BR  
A67-18545
- CHERNETS, A. N.  
MEASUREMENT OF RADIATION PATTERN OF RUBY LASER EMISSION FOR VARIOUS RESONATORS AND OPERATING REGIMES, NOTING LASER EFFECT ON ANGULAR HALF-WIDTH VALUES  
A66-30847
- FREQUENCY TEMPERATURE DEPENDENCE OF LONGITUDINAL AND TRANSVERSE HYPERSONIC WAVE ABSORPTION COEFFICIENTS IN QUARTZ AND ARTIFICIAL RUBY CRYSTAL  
A66-42514
- CHERNOV, V. A.  
NEODYMIUM GLASS LASER TIME CHARACTERISTICS AND SPECTRAL CHANGES DURING CONVERSION TO TRAVELING WAVE LASER  
A67-18782
- CHERNYKH, N. S.  
MEASUREMENT OF DISTANCE TO MOON BY OPTICAL RADAR, DISCUSSING RUBY LASER/PHOTOMULTIPLIER APPARATUS AND PROCEDURE  
A66-30291
- LUNAR FIGURE AND ORBIT PARAMETERS MEASURED BY OPTICAL LOCATION METHOD  
A66-35285
- DESCRIPTION OF RUBY LASER USED IN OPTICAL LOCATION OF MOON  
NASA-TT-F-8866  
N66-29428
- CHERNYSHEV, V.  
RUBY LASERS IN SPACE COMMUNICATION  
FTD-TT-65-1683/164  
N66-26501
- CHERNYSHEV, V. N.  
BOOK ON LASER APPLICATIONS IN RADIO COMMUNICATION
- SYSTEMS  
A66-43226
- CHERRINGTON, B. E.  
SPATIALLY RESOLVED HE- NE LASER HETERODYNE MEASUREMENTS OF ELECTRON NUMBER DENSITIES IN WEAKLY IONIZED AR PULSED DISCHARGES  
A67-17272
- CHESTER, A. N.  
10.6 MICRON OUTPUT OF CARBON DIOXIDE- HE LASER MODULATED, USING BRAGG DIFFRACTION FROM LONGITUDINAL ACOUSTIC WAVES IN TE  
A66-42251
- CHETKIN, M. V.  
MAGNETO-OPTICAL MODULATION OF IR EMISSION OF HE- NE GAS LASER  
A67-15139
- CHIANG, C. W.  
BUBBLE GROWTH PARAMETERS IN SATURATED AND SUBCOOLED NUCLEATE BOILING AND ANALYSIS OF SINGLE BUBBLE GENERATED BY USING LASER BEAM ON THERMOCOUPLE OR FLAT PLAT SUBMERGED IN WATER  
NASA-CR-81673  
N67-17962
- CHIAO, R. Y.  
DEGENERATE STIMULATED FOUR-PHOTON INTERACTION AND FOUR-WAVE PARAMETRIC AMPLIFICATION OBSERVED IN RUBY LASER AND LIQUID CELL ARRANGEMENTS  
A67-16379
- PROPERTIES OF SELF-TRAPPED LIGHT FILAMENTS NOTING STIMULATED RAMAN EMISSION AND CREATION, CONTAINMENT AND TERMINATION MECHANISMS  
A67-16648
- NEW CLASS LIGHT FILAMENT IDENTIFIED IN RAMAN RADIATION OF INTENSE RUBY LASER BEAM  
NASA-TM-X-57831  
N66-33863
- CHILD, M. R.  
HELIUM COOLING SYSTEM FOR SOLID STATE MASER AMPLIFIER INSTALLATION AT COMMUNICATION SATELLITE GROUND STATION  
N67-12314
- CHILINGARIAN, IU. S.  
SPECTRAL AND TIME-DEPENDENT CHARACTERISTICS OF STIMULATED RADIATION FROM RUBY PULSE LASER, USING FABRY- PEROT ETALON IN FINE-STRUCTURE OBSERVATION  
A66-39823
- CHILINGARYAN, YU. S.  
TEMPERATURE DEPENDENCE OF FLUORESCENT FREQUENCY SHIFT IN RUBY LASER  
FTD-TT-65-2006  
N67-10978
- CHIPAUX, C.  
LASER ACTION IN GALLIUM ANTIMONIDE DIODES, EXAMINING EMITTED LIGHT SPECTRUM VS INJECTED CURRENT, TEMPERATURE EFFECT, RADIATIVE EFFICIENCY, ETC  
A66-26184
- CHIRKIN, A. S.  
STATISTICAL EFFECTS DURING GENERATION OF SECOND HARMONIC IN OPTICALLY TRANSPARENT CRYSTALS, NOTING COEFFICIENT OF CORRELATION BETWEEN HARMONIC AND FUNDAMENTAL RADIATION POWER OF SOLID STATE LASER  
A66-31167
- STATISTICAL EFFECTS DURING GENERATION OF SECOND HARMONIC IN OPTICALLY TRANSPARENT CRYSTALS, NOTING COEFFICIENT OF CORRELATION BETWEEN HARMONIC AND FUNDAMENTAL RADIATION POWER OF SOLID STATE LASER  
A67-12928
- CHODOROW, M.  
ACOUSTIC WAVE AMPLIFICATION STUDIES, OPTICAL MASER RESEARCH, OSCILLATIONS IN SEMICONDUCTORS, AND BULK INSTABILITIES IN FERROMAGNETIC MATERIALS  
ML-1424  
N66-37453
- THEORY AND EXPERIMENTS IN MICROWAVE PROPAGATION AND AMPLIFICATION USING SOLID STATE DEVICES, AND CALCULATIONS OF ELECTRONIC DEFLECTION OF LASER BEAMS  
NASA-CR-80727  
N67-13665
- CHOMAT, M.  
STATISTICAL DISTRIBUTION OF AM LASER SIGNAL

- ENVELOPE UPON PASSAGE THROUGH TURBULENT ATMOSPHERE  
A67-13988
- CHRISTENSEN, A. B.  
WRITING RATE OF ROTATING-MIRROR STREAK CAMERA  
DETERMINED, USING Q-SWITCHED LASER TECHNIQUE  
A66-30419
- CHRISTIE, R. H.  
PHOTOGRAPHIC RADAR SYSTEM EMPLOYING Q-SWITCHED  
RUBY LASER, MULLARD TYPE 6929 IMAGE TUBE AND  
CONVENTIONAL CAMERA  
A66-38796
- CHU, T. S.  
MEASUREMENTS OF MASER BEAM PROPAGATED THROUGH  
ATMOSPHERE, EMPHASIZING BEAM BROADENING AND SIGNAL  
FLUCTUATION DUE TO CLEAR AIR TURBULENCE  
A66-28581
- WAVELENGTH DEPENDENCE OF SPECTRUM OF LASER BEAMS  
TRAVERSING ATMOSPHERE  
A67-16793
- CHUGAEV, V. N.  
LASER BEAM-INDUCED RECRYSTALLIZATION OF AMORPHOUS  
GE SEMICONDUCTOR THIN FILMS PREPARED BY THERMAL  
DEPOSITION ON GLASS  
A67-13839
- CHUNAIEV, O. N.  
STATISTICAL EFFECTS DURING GENERATION OF SECOND  
HARMONIC IN OPTICALLY TRANSPARENT CRYSTALS, NOTING  
COEFFICIENT OF CORRELATION BETWEEN HARMONIC AND  
FUNDAMENTAL RADIATION POWER OF SOLID STATE LASER  
A66-31167
- STATISTICAL EFFECTS DURING GENERATION OF SECOND  
HARMONIC IN OPTICALLY TRANSPARENT CRYSTALS, NOTING  
COEFFICIENT OF CORRELATION BETWEEN HARMONIC AND  
FUNDAMENTAL RADIATION POWER OF SOLID STATE LASER  
A67-12928
- CHURCH, C. H.  
PULSED ARC XENON DISCHARGES USED FOR OPTICAL  
PUMPING OF HIGH ENERGY LASERS  
AD-632892  
N66-31537
- CHUVAYEV, K. K.  
DESCRIPTION OF RUBY LASER USED IN OPTICAL LOCATION  
OF MOON  
NASA-TT-F-8866  
N66-29428
- CHWALKO, R.  
SPATIAL COHERENCE MEASUREMENT OF HE- NE LASER  
OUTPUT  
A66-35592
- CLARK, P. O.  
DOUBLE PROBE AND MICROWAVE RESONANCE MEASUREMENTS  
OF GAS ADDITIVES EFFECT ON RADIAL VARIATION OF  
ELECTRON TEMPERATURE AND DENSITY WITH PARTIAL  
PRESSURES IN CARBON DIOXIDE-NITROGEN-HELIUM GAS  
LASER  
A67-17274
- CLARK, R. J., JR.  
RUBY LASER USED IN VAPOR DEPOSITION OF THIN METAL  
FILMS  
UD-2037-E-1  
N66-32219
- CLASS, W.  
ELECTRON BEAM MELTING AND FLOAT ZONE CRYSTAL  
GROWTH TECHNIQUES FOR PROCESSING ALUMINUM OXIDE  
AND RELATED MATERIALS USED IN LASER TECHNOLOGY  
AFCRL-66-473  
N67-10948
- CLAUSS, R.  
TRAVELING WAVE MASER FOR 85-FOOT ANTENNA AT VENUS  
DEEP SPACE STATION  
N66-38567
- CLAUSS, R. C.  
TUNING RANGE EXTENSION OF KLYSTRONS USED FOR  
PUMPING S-BAND TRAVELING WAVE MASERS  
N67-14441
- LOW NOISE RECEIVERS - TRAVELING WAVE MASER  
DEVELOPMENT  
N67-15913
- TUNABLE TRAVELING WAVE MASER FOR DEEP SPACE  
COMMUNICATIONS AND PLANETARY RADAR  
JPL-TR-32-1072  
N67-17168
- CLAY, B. R.  
MICROSCOPIC HOLE DRILLING INTO METALS BY LASER  
BEAMS, NOTING ENERGY AND POWER CORRELATION WITH  
HOLE MAGNITUDE  
A67-19090
- CLAY, W. G.  
NANOSECOND PULSE LIGHT SOURCES USED IN FREE FLIGHT  
HYPERSONICS FOR BALLISTIC RANGE MEASUREMENTS,  
NOTING LESS PHOTOGRAPHIC BLURRING OF MOTION  
A67-18881
- CLEMESHA, B. R.  
HIGH ALTITUDE ATMOSPHERIC SCATTERING OF INTENSE  
LIGHT FROM RUBY LASER BEAM INTERPRETED PRINCIPALLY  
IN TERMS OF RAYLEIGH SCATTERING FROM ATMOSPHERIC  
MOLECULES  
A67-19419
- CLOSE, D. H.  
FIRST- AND SECOND-ORDER SIDEBANDS DUE TO STRONG  
CW SIGNAL INTERMODULATION EFFECT IN 3.39 MU HE-  
NE LASER  
A66-33615
- EFFECTS OF GAIN SATURATION BY STRONG TRAVELING  
FIELDS IN DILUTE LASER MEDIA, NOTING ATOMIC MOTION  
AND LINE BROADENING  
A67-20126
- HIGH ENERGY DIFFRACTION LIMITED RAMAN LASER  
REALIZATION STUDIES  
AD-636250  
N66-37176
- COCKE, W. J.  
ATOMIC MASER CLOCKS ROTATION WITH EARTH, DERIVING  
FORMULA FOR RELATIVE DRIFT AT WIDELY SEPARATED  
LOCALITIES ARISING FROM LOCAL GRAVITATIONAL  
POTENTIALS  
A66-30187
- COHEN, M. G.  
OPTICAL BEAM SCATTERING OF GAS LASER FOR  
MEASUREMENT OF PHOTOELASTIC CONSTANTS AND  
APPLICATION TO LITHIUM NIOBATE  
A66-28692
- OPTICAL MODULATION IN BULK GALLIUM ARSENIDE, USING  
GUNN EFFECT  
A66-33606
- COLEMAN, P. D.  
118-MICRON WAVELENGTH WATER VAPOR GAS LASER WITH  
4-INCH DIAMETER TWO-METER FOCAL LENGTH MIRROR  
RESONATOR SYSTEM  
A66-29010
- TIME BEHAVIOR OF PULSED WATER VAPOR LASER, NOTING  
SPIKING FROM FAR IR EMISSION LINES  
A67-20095
- GAS LASER STUDIES IN 100 TO 1000 MICRON RANGE  
AFOSR-66-0719  
N66-29864
- COLEMAN, W. J.  
EXTENSOMETER FOR MEASURING SMALL CHANGES OF  
SPECIMEN ON TENSILE TESTING VACUUM FURNACE AT  
HIGH TEMPERATURES, USING CW GAS LASER AS LIGHT  
SOURCE  
A67-11036
- LASER EXTENSOMETER MEASURING SMALL DIMENSIONAL  
CHANGES OF SPECIMEN IN TENSILE TESTING FURNACE AT  
HIGH TEMPERATURES  
A67-18778
- COLLIER, R. J.  
HOLOGRAPHY PRINCIPLES, DISCUSSING BASIC EQUATION,  
FOURIER TRANSFORM HOLOGRAMS AND HOLOGRAM  
INTERFEROMETRY  
A66-36929
- COLLINS, R. J.  
COUPLING BETWEEN OPPOSITELY DIRECTED TRAVELING  
WAVES IN HE- NE RING LASER IN FORM OF MUTUAL  
BACKSCATTERING OF ENERGY FROM EACH BEAM INTO  
DIRECTION OF OTHER  
A66-37778
- GIANT OPTICAL RADIATION PULSES FROM RUBY LASERS  
BY CONTROL OF STATIC CAVITY GEOMETRY  
TR-4  
N67-10950
- COLLIS, R. T. H.  
ATMOSPHERIC OBSERVATION WITH ADVANCED LIGHT RADAR,  
NOTING EQUIPMENT CHARACTERISTICS, MOLECULAR  
SCATTERING MECHANISM, ETC  
A66-26133
- LIGHT DETECTION AND RANGING / LIDAR/ TECHNIQUE USE  
IN ATMOSPHERIC RESEARCH, PARTICULARLY  
METEOROLOGICAL FACTORS IMPORTANT TO AVIATION AND

- ROCKET OPERATIONS  
AIAA PAPER 65-464 A66-27892
- ATMOSPHERIC EXPLORATION WITH LIDAR, NOTING HIGH  
RESOLUTION AND SENSITIVITY A66-28600
- COLLIVER, D. J.  
COMPACT DISCHARGE LAMP DESIGNED FOR CONTINUOUS  
PUMPING OF SOLID STATE LASER, WITH INTEGRAL MOUNTS  
FOR CRYSTALS AND ENCLOSURE PROVIDING COOLING  
CIRCUITS FOR LAMP AND CRYSTAL A66-41247
- COMISAR, G. G.  
NONLINEAR SCATTERING OF RUBY LASER BEAM BY PLASMA  
AT SECOND AND THIRD HARMONIC A66-32433
- COMPTON, D. M. J.  
OPTICAL EMISSION FROM RUBY INDUCED BY SHORT  
PULSES OF RELATIVISTIC ELECTRONS IN WHICH  
ELECTRON-HOLE RECOMBINATION PRODUCES EXCITATION OF  
EMISSION A66-26173
- EFFECTS OF SPACE RADIATION ON LASERS  
NASA-CR-79108 N66-39911
- CONDON, R. J.  
VELOCITY ABERRATION AND ATMOSPHERIC REFRACTION  
PERTAINING TO LASER SATELLITE COMMUNICATION  
EXPERIMENTS, OBTAINING EQUATIONS FOR ESTIMATION OF  
EFFECTS A67-12054
- CONGER, R. L.  
LIGHT ENERGY MEASUREMENTS MADE WITH ARGON BOMB  
USED AS CHEMICALLY POWERED LASER PUMP A66-35388
- CONNERS, G. H.  
THERMOELASTIC WAVE EQUATIONS IN CONTINUUM  
MECHANICS MODEL OF LASER-INDUCED FRACTURE IN  
TRANSPARENT MEDIA IN TERMS OF LASER BEAM ENERGY  
ABSORPTION A66-40089
- CONSOLI, T.  
PRODUCTION OF NEUTRAL OR IONIZED GAS PLASMOIDS BY  
FOCUSING BEAM OF COHERENT LIGHT EMITTED BY RUBY  
LASER ON TARGET OF PURE METAL OR METAL CONTAINING  
GAS A66-26819
- LASER BEAM TECHNIQUES FOR STUDY OF PLASMAS WITH  
HIGH ELECTRON DENSITIES A66-26822
- CONSORTINI, A.  
LASER RADIATION COHERENCE PROPERTY DETERIORATION  
AND MOLECULAR SCATTERING DURING PROPAGATION  
THROUGH TURBULENT ATMOSPHERE A66-27131
- CONVERT, G.  
ION LASERS INVOLVING ELECTRON TRANSITIONS IN ATOMS  
OR MOLECULES WITH LOST ELECTRONS A66-33249
- COOMBS, H. D.  
LASER GUIDANCE SYSTEM FOR RENDEZVOUS AND DOCKING  
PROVIDING DATA ACQUISITION FOR GUIDANCE COMPUTER  
A67-15663
- COOMBS, W. F.  
LASER DAMAGE OF THIN FILMS - ENERGY DENSITY  
THRESHOLDS DETERMINED FOR SINGLE QUARTERWAVE AND  
HALFWAVE FILMS VACUUM EVAPORATED ON GLASS AND  
QUARTZ SUBSTRATES N66-34015  
AD-633554
- COONEY, J. A.  
LASER APPLICATION TO METEOROLOGY, DISCUSSING  
RAYLEIGH, AEROSOL AND RAMAN SCATTERING, SYSTEM  
CONFIGURATION AND MEASUREMENT PROBLEMS A67-19091
- COOPER, B.  
COHERENT LASER LIGHT USE IN ATMOSPHERIC  
COMMUNICATIONS SYSTEM, DISCUSSING EFFECT OF  
ATMOSPHERIC TURBULENCE AND SMALL VIBRATIONS ON  
COHERENT DETECTION EFFICIENCY AND SNR A66-36930
- EFFECTS OF RUBY LASER RADIATION ON OCULAR TISSUE  
OF RABBITS AND ESTIMATION OF HUMAN CORNEAL  
THRESHOLD
- FA-R-1815 N67-10968
- COOPER, H. G.  
THRESHOLD STUDIES OF ION LASER OSCILLATIONS IN  
SULFUR AND SATURATION AND QUENCHING OF LASER  
INTENSITY A66-26209
- CORDOVER, R. H.  
HELIUM-NEON GAS LASER USED TO STUDY PRESSURE  
EFFECT ON LINE SHAPE OF 2S-2P OPTICAL TRANSITIONS  
OF NEON EXCITED STATES A66-26198
- CORNACCHIO, J. V.  
MAGNITUDE AND PHASE OF COMPLEX SPATIAL COHERENCE  
OF HE- NE LASER BEAM A66-26334
- CORNELY, R. H.  
LASER DIGITAL DEVICES, DISCUSSING USE AS SWITCHING  
CIRCUIT IN DIGITAL COMPUTER A67-19088
- COURT, I. M.  
LIGHT REFLECTION FROM SHOCK WAVES CLARIFIED  
THROUGH PROPAGATION IN SHOCK TUBES, USING GAS  
LASER A66-40012
- CRIFE, D. M.  
GROWTH OF SINGLE CRYSTALS OF RARE-EARTH FLUORIDES  
FOR LASER APPLICATION, USING HYDROGEN FLUORIDE  
ATMOSPHERE, NOTING ION EXCHANGE PURIFICATION  
A66-31082
- CROSIGNANI, B.  
FIRST AND SECOND ORDER CORRELATION FUNCTIONS FOR  
FIELD OBTAINED BY SUPERPOSITION OF TWO LASER MODES  
THROUGH YOUNGS EXPERIMENT, USED TO DETERMINE  
COHERENCE AND STATISTICAL PROPERTIES A67-12634
- STATISTICAL DETERMINATION OF CORRELATION FUNCTIONS  
OF PLASMA SCATTERED COHERENT LIGHT A67-17824
- CROSS, L. A.  
PROPERTIES OF URANYL-DOPED GLASS FOR APPLICATION  
AS SATURABLE OPTICAL FILTER FOR USE WITH LASERS  
A67-10009
- SATURABLE OPTICAL FILTER IN LASER AMPLIFICATION  
CHAIN USED AS ISOLATOR TO LIMIT RADIANCE  
DEPUMPING EFFECTS N66-30020  
AD-632007
- CROSS, L. G.  
PROPERTIES OF URANYL-DOPED GLASS FOR APPLICATION  
AS SATURABLE OPTICAL FILTER FOR USE WITH LASERS  
A67-10009
- CROWE, J. W.  
I R GA AS LASER AMPLIFIER WITH GAINS AS HIGH AS  
2000, OUTPUT POWERS OF 150 MW AND SATURATION  
OCCURRING WITH CURRENT INCREASE AT LOW LIGHT  
LEVELS A66-42562
- LINE WIDTH OF CW GA- AS LASERS MEASURED USING  
HOMODYNE DETECTION AND AUTOCORRELATION A67-16670
- CULSHAW, W.  
TRANSVERSE AND AXIAL MAGNETIC FIELD EFFECTS ON GAS  
LASERS, DERIVING EXPRESSION FOR ATOMIC AND  
MACROSCOPIC POLARIZATION, DETERMINING OSCILLATION  
MODE CHARACTERISTICS, FREQUENCY RESPONSES, ETC  
A66-29813
- QUENCHING AND HYSTERESIS EFFECTS BETWEEN ZEEMAN  
OSCILLATIONS ON SINGLE AXIAL MODE OBSERVED IN  
NEAR-ZERO MAGNETIC FIELDS FOR SHORT PLANAR LASER  
A66-39116
- ZEEMAN LASER INTERFEROMETER, USING AXIAL MAGNETIC  
FIELD TO OBTAIN SIMULTANEOUS LEFT- AND RIGHT-HAND  
CIRCULARLY POLARIZED OSCILLATION MODES AT UPPER  
AND LOWER CAVITY RESONANCES A66-42248
- CUMMINS, H. Z.  
LASER EXCITED RAMAN SCATTERING STUDIED AS MEANS  
FOR INVESTIGATING CRYSTALS CONTAINING IMPURITIES  
AD-637256 N67-11104

CUNNINGHAM, J. L.  
LASER MICROPROBE USED TO STUDY SMALL INCLUSIONS IN METALS  
A67-15461

CUTRONA, L. J.  
LASER APPLICATION TO RADAR SIGNAL PROCESSING AND COMMUNICATIONS EQUIPMENT  
A67-15303

## D

DAENDLIKER, R.  
THRESHOLD DETERMINATION OF PULSED RUBY LASER BY SINGLE PULSE TECHNIQUE  
A66-37548

DAGLISH, H. N.  
LOW TEMPERATURE TECHNIQUES IN SATELLITE COMMUNICATIONS SYSTEMS, NOTING MASER, COOLED PARAMETRIC AMPLIFIER AND TREND TOWARD CLOSED-CYCLE REFRIGERATORS  
A66-26104

HELIUM COOLING SYSTEM FOR SOLID STATE MASER AMPLIFIER INSTALLATION AT COMMUNICATION SATELLITE GROUND STATION  
N67-12314

DAHLQUIST, J. A.  
ZEEMAN LASER INTERFEROMETER, USING AXIAL MAGNETIC FIELD TO OBTAIN SIMULTANEOUS LEFT- AND RIGHT-HAND CIRCULARLY POLARIZED OSCILLATION MODES AT UPPER AND LOWER CAVITY RESONANCES  
A66-42248

DAIBER, J. W.  
THERMALIZATION OF PLASMA BY CREATING IMPLoding SHOCK WAVE DRIVEN BY LASER ENERGY RELEASE  
A66-26683

DAILEY, J. L.  
OPTICAL SYSTEM CONSISTING OF POLARIZED LASER BEAMS FOR MONITORING MISSILE ATTITUDE DURING EARLY LAUNCH PHASE  
A67-14505

DAINO, B.  
FREQUENCY FLUCTUATIONS OF LASER FIELD DETERMINED BY MEASURING CROSS CORRELATION FUNCTION AT TWO POINTS  
A67-16625

DALY, N. R.  
LASER VAPORIZATION AND IONIZATION OF SOLID MATERIALS TO OBTAIN IONS FOR TIME-OF-FLIGHT MASS SPECTROMETER  
A66-39385

DAMON, E. K.  
THRESHOLD DATA FOR RUBY AND NEODYMIUM LASER PULSE-INDUCED BREAKDOWN IN Xe, Ar, Kr, Ne, He, OXYGEN, NITROGEN, AIR AND CARBON DIOXIDE  
A66-26191

DANEU, V.  
SINGLE TRANSVERSE AND LONGITUDINAL MODES OBSERVED IN OUTPUT OF PASSIVE Q-SWITCHED RUBY LASER WHEN TWO SPHERICAL MIRRORS ARE USED FOR RESONATOR  
A66-42563

DANGOR, A. E.  
HELIUM-NEON LASER USED WITH VARIOUS INTERFEROMETERS TO MEASURE RAPID ELECTRON DENSITY CHANGES IN ARGON PLASMA  
N67-15240

DANIELSON, G. E., JR.  
TRAJECTORIES OF LIGHT RAYS THROUGH MEDIUM SUBJECTED TO ACOUSTIC WAVES EXAMINED KNOWING THAT ACOUSTIC WAVES IN LASER MEDIUM FUNCTION AS OPTICAL WAVEGUIDE  
A66-38238

DANILOVA, T. N.  
RECOMBINATION RADIATION FROM Ga AS P-N JUNCTIONS WITH AND WITHOUT FABRY-PEROT RESONATOR, NOTING PARAMETER DEPENDENCE ON CURRENT DENSITY  
A66-40314

DANOVICH, J. F.  
MASERS AS EXCITATION MEANS FOR SPECTROGRAPHIC EXAMINATION OF METAL MICROSTRUCTURE  
AD-632240  
N66-29847

DAREK, B.  
GALLIUM ARSENIDE LASER DESIGN USING P-N JUNCTION OBTAINED BY DIFFUSION OF ZINC IN TELLURIUM DOPED N-Ga AS SINGLE CRYSTAL  
A66-29057

DARONE, R.  
VIBRATIONAL-ROTATIONAL LINE STRENGTHS AND WIDTHS IN CARBON DIOXIDE, USING CARBON DIOXIDE-NEON LASER  
A66-27030

DASARO, L. A.  
LOW NOISE PHOTODIODES WITH AVALANCHE MULTIPLICATION FOR HIGH SENSITIVITY, NOTING CAPABILITY FOR LOW INTENSITY WIDEBAND SIGNAL DETECTION, PERFORMANCE IN IR REGION, ETC  
A66-31934

DAVID, C.  
ELECTRON DENSITY, OPTICAL THICKNESS AND TEMPERATURE OF RUBY LASER-INDUCED CARBON PLASMA  
A67-16654

DAVID, E.  
LASER TECHNOLOGY - MATERIALS, CONTROL, FUNCTIONS, DEMODULATION, AND PRACTICAL APPLICATIONS  
NASA-TT-F-10201  
N66-33688

DAVIDOVITS, P.  
LIGHT SHIFT, LIGHT MODULATION AND PHASE PULLING IN OPTICALLY PUMPED RUBIDIUM MASER  
A66-26202

DAVIES, W. E. R.  
COOPERATIVE INTERACTIONS BETWEEN IONS AND ELECTRONS IN FORWARD SCATTERING OF RUBY LASER BEAM FROM PLASMA  
A66-30153

DAVIS, B. I.  
HIGH POWER NONSPIKING OPERATION OF RUBY LASER FOR CONTINUOUS OUTPUT ON MICROSCOPIC AND MACROSCOPIC SCALE  
A66-38242

DAVIS, Q. V.  
ERROR DUE TO MULTIPLE PROPAGATION IN DISTANCE MEASUREMENT BY COMPARISON OF MODULATION PHASES ON TRANSMITTED AND REFLECTED LASER BEAM  
A67-19606

DAVIS, R. B.  
LASER ACCELERATOR CALIBRATOR AS STANDARD FOR VIBRATION DISPLACEMENT MEASUREMENTS  
N66-28461

DAW, H. A.  
TEMPERATURE SHIFT OF RUBY LASER EMISSION MEASURED INTERFEROMETRICALLY FOR TEMPERATURES BETWEEN 66 AND 210 DEGREES K  
A66-28701

DE COATPONT, Y.  
IRON DOPED RUTILE TRAVELING WAVE MASER OPERATING IN 34-36 G HZ FREQUENCY RANGE  
A67-19605

DE CREMOUX, B.  
COHERENT LASER-TYPE LIGHT GENERATORS WITH CAPABILITY OF ADJUSTING FREQUENCY OVER VISIBLE SPECTRUM  
A66-36265

DE GENNES, P. G.  
EFFECTIVE DIFFUSION CROSS SECTION OF ULTRASONIC AND LASER BEAM WHILE ACTING ON TURBULENT FLOW  
A66-25404

DE LA CIERVA, J.  
DYNALENS OPTICAL ELEMENT CHARACTERIZED BY VARIABLE-GEOMETRY FLUID PRISM THAT DEFLECTS BEAM OF LIGHT OR ELECTROMAGNETIC ENERGY  
A67-11132

DE LA PERRELLE, E. T.  
ENERGY AND POWER OF Q-SWITCHED NEODYMIUM GLASS LASER MEASURED, USING CALORIMETRIC DEVICES, VACUUM PHOTODIODES, ETC  
A66-34904

DE LANG, H.  
TIME DEPENDENCY OF PHASE DIFFERENCE OF TWO WEAKLY COUPLED NONLINEAR OPTICAL OSCILLATORS, CONSIDERING COUPLING OF TWO TRAVELING WAVES IN LASER  
A66-42257

DE LARA-BENZAQUEN, E. C.  
OPTICAL PATHS AND VARIABLE-CONTRAST INTERFERENCE AT MICHELSON INTERFEROMETER WHICH ADDS TWO GROUPS OF TWO LASER COHERENT WAVES  
A67-17636

- DE MARS, G.  
SPECTRAL AND MODE PROPERTIES OF RUBY, SOLID STATE,  
FABRY- PEROT, AND NEODYMIUM-DOPED YAG LASERS  
S-852 N66-30264
- DE METZ, J.  
INTENSITY DISTRIBUTION AT FOCUS OF HIGH POWER  
LASER, NOTING MEASURING METHOD A66-28834
- DE MICHELIS, C.  
PLASMA PRODUCTION BY FIRING GIANT PULSE LASER AT  
SOLID DEUTERIUM PELLET /ICE/, NOTING STRONG  
ANISOTROPY IN PLASMA OUTBURST A66-36595
- DE TEMPLE, T. A.  
PULSED COAXIAL TRANSMISSION LINE NITROGEN GAS  
LASER, NOTING PRESSURE EFFECT A66-40107
- DE VOIGT, M. J. A.  
MICHELSON INTERFEROMETER USED TO STUDY MODES OF  
RED HE- NE LASER A66-33316
- DEACON, J.  
LASER INDUCED PLASMA DENSITY MEASUREMENT USING  
MULTIPLE BEAM INTERFEROMETRY A66-41630
- DEAN, D. R.  
GIANT OPTICAL RADIATION PULSES FROM RUBY LASERS  
BY CONTROL OF STATIC CAVITY GEOMETRY  
TR-4 N67-10950
- DEBEVER, J. M.  
STIMULATED EMISSION FROM ELECTRON BEAM EXCITATION  
OF TELLURIUM AND PURE AND N-TYPE DOPED INDIUM  
ANTIMONIDE IN SEMICONDUCTOR LASERS  
A66-26179
- DEBEVER, J.-M.  
LASER EMISSION IN PURE CADMIUM SULFIDE CRYSTALS  
BOMBARDED BY ELECTRON BEAMS A67-12812
- DECOMPS, B.  
NEON LEVEL BROADENING UNDER EFFECT OF LASER  
RADIATION STUDIED BY OBSERVING HANLE EFFECT ON  
FLUORESCENT LIGHT A66-29640
- MAGNITUDE OF HANLE EFFECT OF NEON ATOMS EMITTED  
BY LASER DEPENDENCE ON EXCITATION DISCHARGE  
INTENSITY EXPLAINED BY MULTIPLE COHERENT DIFFUSION  
AT METASTABLE LEVEL A66-37409
- DEGIORGIO, V.  
COUPLING MECHANISM IN PASSIVE Q-SWITCHING  
OPERATION BETWEEN FILAMENTS AT DIFFERENT REGIONS  
OF RUBY LASER ROD A67-10813
- DELL-IMAGINE, R. A.  
MULTIPLE SCATTERING EFFECTS ON PROPAGATION OF  
COHERENT OPTICAL SIGNALS STUDIED FOR LASER  
COMMUNICATIONS APPLICATION A66-28580
- DELONE, G. A.  
MULTIPHOTON IONIZATION OF KRYPTON AND ARGON BY  
RUBY LASER RADIATION MAY OCCUR BY ABSORPTION  
A66-36721
- MULTIPHOTON IONIZATION OF KRYPTON ATOM BY RUBY  
LASER RADIATION A67-18796
- DELONE, N. B.  
SPATIAL DISTRIBUTION OF ELECTRICAL FIELD OBTAINED  
BY FOCUSING RADIATION OF RUBY LASER  
A66-25967
- MULTIPHOTON IONIZATION OF KRYPTON AND ARGON BY  
RUBY LASER RADIATION MAY OCCUR BY ABSORPTION  
A66-36721
- MULTIPHOTON IONIZATION OF XENON ATOM IN POWERFUL  
ELECTRIC FIELD BY RUBY LASER RADIATION  
A66-39545
- MULTIPHOTON IONIZATION OF KRYPTON ATOM BY RUBY  
LASER RADIATION A67-18796
- DELPECH, J.-F.  
GAS LASER ALIGNMENT, OBTAINING OSCILLATION ON  
THREE LINES OF HE- NE LASER A66-39718
- LASER OSCILLATION EFFECT ON CHARACTERISTICS OF  
ELECTRON GAS OF HELIUM-NEON LASER PLASMA STUDIED  
IN TERMS OF WAVE ATTENUATION IN PLASMAGUIDE  
A66-43006
- MICROWAVE MODULATION OF HELIUM-NEON LASER  
INTENSITY STUDIED AS FUNCTION OF TEMPERATURE AND  
ELECTRON DENSITY A67-10260
- ELECTRON COLLISION RATE AND DENSITY CALCULATIONS  
FOR HE- NE LASER PLASMA A67-16598
- DEMARIA, A. J.  
REVERSIBLE BLEACHABLE DYE-SOLUTIONS FOR EXPANDER  
ELEMENTS IN LASER A66-29388
- PHOTODISSOCIATION LASER SYSTEM, DISCUSSING OUTPUT  
ENERGY DEPENDENCE ON PRESSURE, TEMPERATURE AND  
NUMBER OF SUCCESSIVE OPTICAL PUMPING FLASHES  
A66-37781
- TRAJECTORIES OF LIGHT RAYS THROUGH MEDIUM  
SUBJECTED TO ACOUSTIC WAVES EXAMINED KNOWING THAT  
ACOUSTIC WAVES IN LASER MEDIUM FUNCTION AS OPTICAL  
WAVEGUIDE A66-38238
- OPTICAL SPECTRA OF ULTRASHORT OPTICAL PULSES  
GENERATED BY MODE-LOCKED GLASS-DOPED NEODYMIUM  
LASERS, CONSIDERING SATURABLE ABSORBER CELL PLACED  
PARALLEL TO FABRY- PEROT REFLECTOR  
A66-39115
- CONTINUOUSLY VARIABLE OPTICAL DELAY LINE USING  
ACOUSTIC WAVES TO DIFFRACT AND FREQUENCY SHIFT  
PORTION OF ARGON ION LASER BEAM  
A67-12517
- DEMENTEV, V. A.  
HEATING AND SCATTERING OF PLASMA PRODUCED BY  
GIANT LASER PULSE FOCUSED ON SOLID TARGET  
A67-14194
- DENARIEZ, M. M.  
STIMULATED RAMAN EFFECT IN ACETONE AND ACETONE-  
CARBON DISULFIDE MIXTURES, NOTING SIMILARITY OF  
STOKES RADIATION PATTERN TO RAMAN EFFECT  
A66-28881
- DENAVIT, M.  
LOCALIZED DEEP BRAIN TISSUE LESIONS IN CATS BY  
LASER ENERGY A66-81895
- DENTON, R. T.  
OPTICAL MODULATOR USING ELECTRO-OPTIC EFFECT IN  
LITHIUM TANTALATE FOR PCM TRANSMISSION SYSTEMS  
OPERATING AT 224 MEGACYCLE BIT RATE  
A67-10013
- DER AGOBIAN, R.  
LASER OSCILLATOR STUDY OF COHERENT STIMULATED  
EMISSION OF IR TRANSITIONS IN RARE GASES  
A66-27336
- OBLIQUE MODES AND ENERGY OF GAS LASER BEAM  
A67-14913
- DERIUGIN, I. A.  
S HF MODULATION TECHNIQUES FOR LASER RADIATION,  
COVERING FARADAY, KERR AND POKKEL EFFECTS,  
CIRCULAR DICHROISM, ETC A67-13138
- DERR, V. E.  
FISSION OR RADIOISOTOPIC NUCLEAR RADIATION APPLIED  
TO LASER PUMPING, DISCUSSING FORMS, SOURCES,  
POWER, SOLID STATE AND MOLECULAR GAS LASERS,  
ENERGY TRANSFER, OPTICAL FLUORESCENCE AND CUT-OFF  
PHENOMENON A67-16547
- DËSMARES, P.  
HORIZONTAL DEFLECTION IN TV DISPLAY PRODUCED BY  
BRAGG REFLECTION OF LASER LIGHT BY ULTRASONIC  
WAVES IN WATER A66-42816
- DESSEL, N. F.  
THREE-DIMENSIONAL HOLOGRAPHY  
NEL-1403 N67-16644

## DESSUS, B.

NONRECIPROCAL EFFECTS ASSOCIATED WITH EXCITATION  
CURRENT OBSERVED IN D C-EXCITED HE- NE RING  
LASER, NOTING COUPLING PHENOMENA BETWEEN RIGHT  
AND LEFT WAVES A66-37408

## DEUTSCH, CH.

POLARIZATION OF PULSED RADIATION FROM GA AS LASER  
DIODE TO DETERMINE ORIGIN OF NATURAL OSCILLATIONS  
OF RESONATOR A66-37549

## DEUTSCH, T. F.

PULSED DISCHARGES OF OCS MOLECULAR LASER A66-36080

OPTICAL PROPERTIES OF CRYPTOCYANINE NOTING  
TRANSIENT DECAY OF FLUORESCENCE, USING RUBY LASER  
AND TRANSMISSION OF METHANOL SOLUTION A66-40103

NITRIC OXIDE MOLECULAR LASER OBTAINED BY  
DISSOCIATION OF N O- CL IN PULSED ELECTRICAL  
DISCHARGE A67-12510

TRANSIENT AND STEADY STATE IR EMISSION FROM LOW-  
LYING VIBRATIONAL LEVELS OF CARBON DIOXIDE IN  
LASER SYSTEMS, USING DC DISCHARGE A67-16630

## DEUTSCHBEIN, O. K.

FLUORESCENT-SOLID LASERS DESIGN AND PERFORMANCE  
NOTING MATERIALS A66-33250

## DEVLIN, J. J.

LASER MICROPROBE AS EXCITATION SOURCE FOR EMISSION  
SPECTROCHEMICAL ANALYSIS  
AFCL-65-855/I/ N66-29249

## DHEER, M. K.

SECOND HARMONIC GENERATIONS AND MIXINGS OF RAMAN  
LINES PRODUCED IN CYCLOHEXANE, ACETONE, BENZENE  
AND CARBON DISULFIDE, PHOTOGRAPHING FIRST ORDER  
STOKES RADIATION A67-12052

## DI FRANCIA, G. T.

HELIUM-NEON LASER EMISSION ON 6401 ANGSTROM LINE,  
NOTING INTENSITY VS MIRROR SHIFT AND OPTICAL  
CAVITY INSTABILITY A66-26336

## DI PORTO, P.

FIRST AND SECOND ORDER CORRELATION FUNCTIONS FOR  
FIELD OBTAINED BY SUPERPOSITION OF TWO LASER MODES  
THROUGH YOUNGS EXPERIMENT, USED TO DETERMINE  
COHERENCE AND STATISTICAL PROPERTIES A67-12634

STATISTICAL DETERMINATION OF CORRELATION FUNCTIONS  
OF PLASMA SCATTERED COHERENT LIGHT A67-17824

## DIACHENKO, V. V.

SEMICLASSICAL AND RATE EQUATIONS COMPARED FOR  
DETERMINATION OF OUTPUT POWER OF STEADY STATE RUBY  
LASER A67-16628

STEADY STATE LASER DESIGN, COMPARING BALANCE  
METHOD WITH METHOD BASED ON QUASI-CLASSICAL THEORY  
A67-20245

## DIAKONOV, M. I.

DIPOLE MOMENT CALCULATION FOR GAS LASER IN  
MAGNETIC FIELD A66-29348

GAS LASER EMISSION IN WEAK LONGITUDINAL MAGNETIC  
FIELD ASSUMING ZEEMAN SPLITTING IS MUCH SMALLER  
THAN DOPPLER LINEWIDTH A66-32319

DIPOLE MOMENT CALCULATION FOR GAS LASER IN  
MAGNETIC FIELD A66-37353

DEPENDENCE OF EMISSION INTENSITY OF GAS LASER ON  
LONGITUDINAL AND TRANSVERSE MAGNETIC FIELDS, USING  
SIMPLIFIED MODEL A66-41092

GAS LASER BEHAVIOR IN MAGNETIC FIELD, ANALYZING  
DATA ON MAGNETIC EFFECT, ZEEMAN EFFECT AND  
MICROWAVE PUMPING A67-18168

## DIBARTOLO, B.

ABSORPTION BEHAVIOR OF OPTICALLY PUMPED RUBY ROD,  
NOTING AMPLIFICATION AT ROOM TEMPERATURE AND  
ABSORPTION AT CRYOGENIC TEMPERATURE A66-26174

## DIDOMENICO, M., JR.

ULTRASHORT OPTICAL PULSES GENERATED BY MODE  
LOCKING CONTINUOUS NEODYMIUM DOPED YTTRIUM-  
ALUMINUM GARNET LASER A66-29391

SCATTERING MATRIX ANALYSIS OF SINGLE FREQUENCY  
MICHELSON TYPE HE- NE GAS LASER, INCLUDING  
FREQUENCY AND AMPLITUDE STABILITY ANALYSIS OF  
OSCILLATION SPECTRUM A66-42566

## DIENES, A.

LINEARLY AND CIRCULARLY POLARIZED FIELDS IN LASER  
AMPLIFIER INTERACTION WITH AXIAL MAGNETIC FIELD,  
EMPHASIZING COMBINATION TONE PRODUCTION A66-41624

## DIMMOCK, J. O.

COHERENT AND SPONTANEOUS EMISSION FROM LEAD-TIN  
TELLURIDE ALLOYS UPON EXCITATION BY GA AS DIODE  
LASER, NOTING BAND STRUCTURE OF ALLOY SYSTEM  
A66-34159

## DISHINGTON, R. H.

NEODYMIUM LASER OSCILLATOR USING TIME-VARIABLE  
REFLECTOR, NOTING LOADING AND DUMPING OF OPTICAL  
CAVITY WITH NEARLY MAXIMUM AMOUNT OF ENERGY  
A66-39118

OPERATION OF SYNCHRONIZED NEODYMIUM LASER TIME  
VARIABLE REFLECTION / TVR/ OSCILLATOR, USING  
SINGLE POKELS CELL TO OBTAIN Q-SWITCHING AND  
CAVITY DUMPING A67-17525

## DIXON, E. O.

NEODYMIUM-GLASS LASER USING SPONTANEOUS  
AMPLIFIED EMISSION IN NONRESONANT SYSTEM TO OBTAIN  
HIGH BRIGHTNESS OUTPUT PULSE A67-15100

## DIXON, R. G.

SELECTIVE ACCESS LASER DISPLAY BEAM POSITIONER  
RADC-TR-66-447 N67-15327

## DIXON, R. W.

OPTICAL BEAM SCATTERING OF GAS LASER FOR  
MEASUREMENT OF PHOTOELASTIC CONSTANTS AND  
APPLICATION TO LITHIUM NIOBATE A66-28692

10.6 MICRON OUTPUT OF CARBON DIOXIDE- HE LASER  
MODULATED, USING BRAGG DIFFRACTION FROM  
LONGITUDINAL ACOUSTIC WAVES IN TE A66-42251

## DIXON, T. P.

LASER GUIDANCE SYSTEM FOR RENDEZVOUS AND DOCKING  
PROVIDING DATA ACQUISITION FOR GUIDANCE COMPUTER  
A67-15663

## DMITRIEV, V. G.

LIGHT FREQUENCY MULTIPLIERS FOR NONLINEAR OPTICAL  
EFFECTS AT VARIOUS WAVELENGTHS, CONSIDERING  
FOCUSING, LASER BEAM FINITE DIVERGENCE, AIR  
BREAKDOWN, STIMULATED RAMAN EMISSION, ETC  
A66-26146

RUBY AND NEODYMIUM GLASS LASERS SUM FREQUENCY  
GENERATION USING NONLINEAR ELECTRO-OPTICAL KDP  
CRYSTAL A67-17754

## DMITRIEVSKII, O. D.

FAST-ACTING FLUID SEAL FOR Q-FACTOR MODULATION OF  
NEODYMIUM GLASS LASER A66-27595

FAST-ACTING FLUID SEAL FOR Q-FACTOR MODULATION OF  
NEODYMIUM GLASS LASER A66-42729

## DNEPROVSKII, V. S.

PHOTOCONDUCTIVITY INDUCED IN UNCOLORED SODIUM  
CHLORIDE AND ALUMINUM OXIDE SINGLE CRYSTALS BY  
RADIATION FROM RUBY LASER A66-33939

## DOERING, H.

LASER THEORY AND APPLICATION A66-37420

- DOLGIY, V. A.  
OPTIMUM OPERATING CONDITIONS OF RUBY LASER QUANTUM GENERATOR WITH PASSIVE SHUTTER N66-37711
- DOTSSENKO, V. I.  
RUBY LASER FREQUENCY CONVERSION TECHNIQUE BY LASER BEAM SCATTERING AND MIXING OF COMBINED FREQUENCIES A67-13094
- DOUGAL, A. A.  
HIGH-TEMPERATURE RESEARCH WITH INFRARED MASER FOR TIME-SPACE RESOLVED DIAGNOSTICS OF DEUTERIUM PLASMAS ARL-65-270 N66-30302
- DOUGHTY, G.  
DETECTION OF SURFACE SCATTERED LIGHT BY LASER RADIATION AFWL-TR-65-220 N66-24735
- DOUSMANIS, G. C.  
LARGE WAVELENGTH CHANGES IN GALLIUM ARSENIDE INJECTION LASERS DUE TO CHANGES IN CAVITY Q A66-32635
- ROOM TEMPERATURE PERFORMANCE OF GA AS LASER DIODES, USING S C RS TO ACHIEVE HIGH PULSE REPETITION RATE A66-40175
- DOYLE, W. M.  
GAS LASER WITH GENERALIZED POLARIZATION CHARACTERISTICS, NOTING ROLE OF DEGENERATE ATOMIC ENERGY LEVELS A66-36005
- ATOMIC DEGENERACY INFLUENCE ON MODE INTERACTIONS IN GAS LASER A66-39930
- DROZHBIN, I. A.  
CURRENT INJECTION EFFECT ON TIME DELAY OF GA AS LASER RADIATION A67-10083
- DRUET, Y.  
POPULATION INVERSION VARIATION DURING LASER EMISSION AS SHOWN BY MEASUREMENTS OF FLUORESCENCE INTENSITY A67-15497
- DRUMMOND, J. E.  
PLASMA PHYSICS STUDIES - LASER INTERFEROMETER TO MEASURE STRAIN RATE AT KERN RIVER FAULT, PLASMA DIFFUSION, ALFVEN WAVES IN RELATIVISTIC WAVES, AND PLASMA RADIATION FROM SILVER FOILS N66-36419
- DUARDO, J. A.  
QUENCHING OF STIMULATED RAMAN SCATTERING OF COHERENT RADIATION BY TWO-PHOTON ABSORPTION IN ORGANIC LIQUIDS A66-43039
- DUCAUZE, A.  
ELECTRON-ION EMISSION PATTERN DISTRIBUTION OBTAINED BY PULSED LASER FOCUSING ON SOLID TARGET A66-33256
- DUCUING, J.  
NONLINEAR SUSCEPTIBILITY DESCRIBING SECOND HARMONIC GENERATION OF LIGHT MEASURED IN SEMICONDUCTORS WITH ZINC-BLENDE SYMMETRY, USING QUANTUM MECHANICS AND LASER WAVELENGTH A66-26149
- DUDENKOVA, A. V.  
INDIUM ARSENIC ANTIMONIDE SINGLE CRYSTALS IN P-N JUNCTION LASER A66-31767
- INDIUM ARSENIC ANTIMONIDE SINGLE CRYSTALS IN P-N JUNCTION LASER A67-10087
- DUDKIN, V. A.  
GAS LASER OUTPUT AND THRESHOLD IN POPULATION INVERSION FROM PHOTODISSOCIATION OF METHYL IODIDE AND FLUOROIODO METHYLIDYNE A66-35368
- DUGUAY, M. A.  
OPTICAL FREQUENCY TRANSLATION OF PULSES FROM MODE LOCKED LASER, NOTING DOPPLER SHIFTS OF LARGE MAGNITUDE A67-12506
- DUKHOPEL, I. I.  
COHERENCE IN RADIATION PEAKS OF RUBY LASER STUDIED THROUGH INTERFERENCE FIELD A66-33510
- COHERENCE IN RADIATION PEAKS OF RUBY LASER STUDIED THROUGH INTERFERENCE FIELD A66-42124
- DUMONT, M.  
NEON LEVEL BROADENING UNDER EFFECT OF LASER RADIATION STUDIED BY OBSERVING HANLE EFFECT ON FLUORESCENT LIGHT A66-29640
- MAGNITUDE OF HANLE EFFECT OF NEON ATOMS EMITTED BY LASER DEPENDENCE ON EXCITATION DISCHARGE INTENSITY EXPLAINED BY MULTIPLE COHERENT DIFFUSION AT METASTABLE LEVEL A66-37409
- DUNSKI, M.  
FOCUSED LASER COHERENT RADIATION-INDUCED DEGRADATION OF SOLID METHYLENE AND GAS CHROMATOGRAPHIC ANALYSIS OF REACTION PRODUCTS A66-31870
- DUNTLEY, S. Q.  
UNDERWATER LIGHT TRANSMISSION FROM LASERS AND CONVENTIONAL LIGHT SOURCES AD-631033 N66-27790
- DURAFFOURG, G.  
LASER ACTION IN GALLIUM ANTIMONIDE DIODES, EXAMINING EMITTED LIGHT SPECTRUM VS INJECTED CURRENT, TEMPERATURE EFFECT, RADIATIVE EFFICIENCY, ETC A66-26184
- DURAND, G.  
LAMB SELF-CONSISTENT THEORY AND RATE EQUATION APPROXIMATION STUDY OF MAGNETIC DEPOLARIZATION OF VAPOR AND POLARIZATION OF MONOMODE GAS LASER IN MAGNETIC FIELD A67-16644
- DURRETT, R. H.  
AMPLITUDE AND FREQUENCY CHARACTERISTICS OF TRAVELING WAVE RING LASER A67-15777
- DUSHIN, L. O.  
PLASMA DENSITY USING LASER BASED INTERFEROMETER, INTERPRETING PHASE SHIFT OF LASER SIGNAL AS TIME DEPENDENT LASER FREQUENCY VARIATION A66-35817
- DYACHENKO, V. V.  
CONCENTRATION OF CHROMIUM IONS IN RUBY LASER CRYSTAL LATTICE DETERMINED FROM RADIATION OUTPUT CHARACTERISTICS N66-37712
- FLUX VELOCITY, CRYSTAL QUALITY AND DIAMETER, DISTRIBUTION OF CHROMIUM IONS, AND OTHER FACTORS CONSIDERED IN DESIGN OF RUBY LASER OPTICAL GENERATOR N66-37713
- DYER, R. W.  
LASER SYSTEM FOR DIAMOND PIERCING IN WIRE-DRAWING DIES AND CLOSED CIRCUIT TV VIEWING SYSTEM FOR MONITORING OPERATION A67-15309
- VIEWING SYSTEM FOR LASER OPERATING IN PRODUCTION SHOP A67-17792
- E**
- EARVOLINO, L. P.  
LASER WELDING OF AEROSPACE STRUCTURAL ALLOYS AND RESULTANT JOINT PROPERTIES A66-26019
- EASTMAN, D. P.  
STIMULATED BRILLOUIN EFFECT IN HIGH PRESSURE GASEOUS NITROGEN, METHANE, AND CARBON DIOXIDE USING GIANT PULSE LASER N66-35533
- EBERLIN, E. C.  
CESIUM VAPOR USED FOR TRANSFORMER LASER TO BE OPTICALLY PUMPED BY BATTERY OF NEODYMIUM LASERS GPL-A-31-3 N66-33813
- EBERLY, J. H.  
RADIATIVE CORRECTIONS TO THOMSON SCATTERING IN LASER BEAMS ARISING FROM DAMPING OF ELECTRON MOTION AND PHOTON DENSITY, USING QUANTUM MECHANICS A66-30628

- ECHARD, R.  
LASER OSCILLATOR STUDY OF COHERENT STIMULATED  
EMISSION OF IR TRANSITIONS IN RARE GASES  
A66-27336
- ECKARDT, R. C.  
Q-SPOILING OF RUBY LASER BY OPTICAL PUMPING IN  
INTENSE INHOMOGENEOUS MAGNETIC FIELD WITH  
REDUCED GAIN  
A67-12505
- MAGNETIC LOW TEMPERATURE Q-SWITCHING OF RUBY  
LASER  
N67-12648
- EDEN, D. D.  
NEAR-FIELD DIFFRACTION OF HELIUM-NEON LASER AT  
CIRCULAR APERTURES  
A66-31727
- EDWARDS, D. F.  
ELECTRON RECOMBINATION IN LASER PRODUCED HYDROGEN  
DISCHARGE, NOTING TEMPERATURE DECAY DUE TO  
RADIATION, EXPANSION COOLING AND ELECTRON LOSS  
A67-15109
- EFIMKOV, V. F.  
SPECTRAL CHARACTERISTICS OF TWO-PHOTON OPTICAL  
EXCITATION AND LIGHT EMISSION FROM CD SE  
SEMICONDUCTOR LASER WITH MODULATED Q-FACTOR  
A66-37565
- SPECTRAL CHARACTERISTICS OF TWO-PHOTON OPTICAL  
EXCITATION AND LIGHT EMISSION FROM CD SE  
SEMICONDUCTOR LASER WITH MODULATED Q-FACTOR  
A67-15299
- SEMICONDUCTOR LASERS USING SINGLE AND DOUBLE  
PHOTON OPTICAL EXCITATION  
A67-18930
- EGOROVA, V. F.  
EFFECT OF ANOMALOUS DISPERSION ON STIMULATED  
EMISSION SPECTRUM OF DOPED CADMIUM FLUORIDE  
CRYSTALS  
A66-32317
- EHLER, A. W.  
PLASMA FORMED BY LASER PULSE ON TUNGSTEN TARGET,  
MEASURING RADIUS, TEMPERATURE AND RADIATIVE  
PROPERTIES, DEVELOPING MODEL  
A67-18149
- EISENTHAL, K. B.  
UNFOCUSED RUBY LASER RADIATION FIELD-BIPHENYL  
COMPOUND INTERACTION, RESULTING LUMINESCENCE AND  
APPARENT MULTIPHOTON ABSORPTION  
A66-38528
- EISNER, M.  
THERMALIZATION RATE OF HIGHLY IONIZED PLASMA WITH  
INITIALLY HOT IONS AND COLD ELECTRONS, USING LASER  
SCATTERING TO OBSERVE TIME VARIATION OF ELECTRON  
TEMPERATURE  
A67-10912
- ELIASHEVICH, M. A.  
LASER RADIATION EFFECT ON METALS, NOTING  
DISINTEGRATION MECHANISM, INDENTATION FORMATION  
AND VAPOR FORMATION  
A66-39763
- ELISEEV, P. G.  
TIME PARAMETERS OF POWERFUL LASER MEASURED WITH  
GA AS PHOTODIODE, NOTING TIME CONSTANT AND TIME  
RESOLUTION OF PHOTODIODE  
A66-27750
- COHERENT EMISSION OF INDIUM ARSENIDE PHOSPHIDE P-N  
JUNCTION  
A66-31788
- LASER BASED ON EXCITATION OF GALLIUM PHOSPHORUS  
ARSENIDE SOLID SOLUTION BY BEAM OF FAST ELECTRONS  
A66-33304
- INDIUM PHOSPHIDE BASED SEMICONDUCTOR LASER  
AMPLIFICATION, LOSS FACTOR AND RADIATION PATTERN  
A67-10065
- THRESHOLD AND POWER CHARACTERISTICS OF GALLIUM  
ARSENIDE DIODE LASER OPERATING IN PULSED REGIME  
A67-10066
- COHERENT EMISSION OF INDIUM ARSENIDE PHOSPHIDE P-N  
JUNCTION  
A67-10101
- LASER BASED ON EXCITATION OF GALLIUM PHOSPHORUS  
ARSENIDE SOLID SOLUTION BY BEAM OF FAST ELECTRONS
- TEMPERATURE DEPENDENCE OF THRESHOLD CURRENT IN  
INJECTION LASERS IN CONTINUOUS OPERATION UNDER  
LIQUID NITROGEN COOLING  
A67-11824  
A67-18788
- SEMICONDUCTOR MIRROR FOR Q-FACTOR MODULATION OF  
LASER RESONATOR  
A67-18789
- ELLIS, C. B.  
CESIUM VAPOR USED FOR TRANSFORMER LASER TO BE  
OPTICALLY PUMPED BY BATTERY OF NEODYMIUM LASERS  
GPL-A-31-3  
N66-33813
- ELWARD, J. P.  
OPTICAL MODULATION IN BULK GALLIUM ARSENIDE, USING  
GUNN EFFECT  
A66-33606
- EMMETT, J. L.  
CURRENT TRANSDUCER FOR MEASURING CURRENT PULSES IN  
KILOAMPERE RANGE AND SUITABLE FOR LASER RESEARCH  
APPLICATIONS  
A66-42820
- ENDERLEIN, R.  
LIGHT TRANSMISSION THROUGH OPTICAL DIFFRACTION  
LATTICE CONSISTING OF MEDIUM IN EM FIELD OF  
LASER BEAM  
A66-28626
- ENGELHARD, E.  
GAS LASERS FOR INTERFEROMETRIC MEASUREMENTS OF  
LENGTHS, NOTING METHODS THAT STABILIZE WAVELENGTHS  
OF LASERS  
A66-31697
- ENGELHARDT, A. G.  
HIGH TEMPERATURE PLASMAS PRODUCED BY Q-SWITCHED  
LASER BEAM FOCUSED ON ALUMINUM TARGETS  
TID-22928  
N67-13974
- ENGELMANN, R. W. H.  
ACOUSTIC WAVE AMPLIFICATION, OPTICAL MASER,  
TUNABLE LASER, ACOUSTIC WAVE OPTICS, NONUNIFORM  
PLASMA THEORY, SEMICONDUCTOR OSCILLATION, AND  
FERROMAGNETIC METAL STUDIES IN MICROWAVE PROGRAM  
ML-1436  
N67-16339
- ENGWELL, M. S.  
RUBY LASER GIANT PULSE OFF-AXIAL MODES DETECTED  
WITH HIGH RESOLUTION SPHERICAL FABRY-PEROT  
INTERFEROMETER  
A66-41627
- EPPERSON, J. P.  
LASER SYSTEM FOR DIAMOND PIERCING IN WIRE-DRAWING  
DIES AND CLOSED CIRCUIT TV VIEWING SYSTEM FOR  
MONITORING OPERATION  
A67-15309
- EPSTEIN, L. M.  
Q-SWITCH PULSED RUBY LASER IRRADIATION-INDUCED  
CHEMICAL DISSOCIATION AND IONIZATION IN RESIDUAL  
GASES  
A66-42076
- ERICKSON, L. E.  
EXTENSION OF PAPER ON SATURABLE ABSORBER GIANT  
PULSE LASERS TO INCLUDE EFFECTS OF FINITE  
ABSORBER LIFETIME ON PULSE PARAMETERS, NOTING  
PUMP ROLE  
A67-18148
- ERMAKOV, G. A.  
NE- HE LASER OUTPUT DEPENDENCE ON PRESSURE AND  
NONEXCITED ATOM CONCENTRATION  
A66-34696
- NE- HE LASER OUTPUT DEPENDENCE ON PRESSURE AND  
NONEXCITED ATOM CONCENTRATION  
A67-10512
- ERMAKOVA, M. I.  
SUBMILLIMETER WAVELENGTH ELECTRONIC DEVICES,  
EXAMINING DEVELOPMENT OF LASERS AND REFLECTED WAVE  
TUBES WITH OVERLAPPING EFFECTIVE WAVE RANGE  
A66-38004
- SUBMILLIMETER WAVELENGTH ELECTRONIC DEVICES,  
EXAMINING DEVELOPMENT OF LASERS AND REFLECTED WAVE  
TUBES WITH OVERLAPPING EFFECTIVE WAVE RANGE  
A67-17168
- EROMKA, V. D.  
RUBY LASER EXPERIMENT YIELDING GIANT PULSES BY  
SEPARATING MIRRORS FROM CRYSTALS  
A66-25684



- ESEPKINA, N. A.  
NEODYMIUM GLASS LASER TIME CHARACTERISTICS AND SPECTRAL CHANGES DURING CONVERSION TO TRAVELING WAVE LASER A67-18782
- NEODYMIUM GLASS LASER WITH SPHERICAL MIRROR RESONATOR IN STATIONARY REGIME A67-18783
- EVANS, D. E.  
COOPERATIVE SCATTERING OF LASER LIGHT BY THETATRON PLASMA A66-35489
- SCATTERED LIGHT SPECTRUM IN THETATRON PLASMA, NOTING ONSET OF ION WAVE INSTABILITY A67-10248
- FREQUENCY DISTRIBUTION MEASUREMENTS OF RUBY LASER LIGHT SCATTERED BY THETATRON PLASMA CLM-P-104 N66-35301
- EVANS, M. V.  
C W HE- NE LASER COMPARED WITH MERCURY ARC SOURCE, OBTAINING RAMAN SPECTRA OF CARBON TETRACHLORIDE BY THREE METHODS OF EXCITATION A67-13912
- EVANS, W. E.  
HIGH POWERED Q-SWITCHED RUBY LASER / LIDAR/ FOR METEOROLOGICAL APPLICATION, NOTING SYSTEM EQUATIONS, DESIGN, OPERATION, ETC A66-26548
- CIRRUS CLOUD COVER OBSERVATION CAPABILITY AND PERFORMANCE SPECIFICATIONS FOR METEOROLOGICAL SATELLITE LIDAR NASA-CR-76087 N66-29977
- EVERETT, P. N.  
ALIGNMENT OF LASER MIRRORS USING GAS LASER WITH HIGHLY COLLIMATED BEAM OF SMALL DIAMETER A66-25824
- EVTUHOV, V.  
PULSED RUBY LASERS, CONSIDERING PUMPING AND THRESHOLD, OUTPUT, QUANTUM MECHANICS AND VARIATION ON BASIC DEVICE A66-36968
- OUTPUT SPECTRA OF ND DOPED YAG AND RUBY LASERS, DETERMINING MECHANISMS RESPONSIBLE FOR OBSERVED OVERALL LINewidths A67-16660
- EVTUSHENKO, T. P.  
SPECTRAL ANALYSIS OF LASER DISCHARGE IN PURE AND IMPURE HE, OBTAINING SPECTRA OF SPARK AT VARIOUS PRESSURES, DETERMINING ELECTRON CONCENTRATION AT VARIOUS STAGES A66-40946
- EYWARD, R.  
LASER ACTION IN GALLIUM ANTIMONIDE DIODES, EXAMINING EMITTED LIGHT SPECTRUM VS INJECTED CURRENT, TEMPERATURE EFFECT, RADIATIVE EFFICIENCY, ETC A66-26184
- SEMICONDUCTOR LIGHT EMISSION MECHANISMS EXAMINED INCLUDING WAVELENGTH EMITTED, WIDTH OF RAY EMITTED AND EFFICIENCY OF EMISSION A66-36263
- F**
- FABRE, E.  
ELECTROSTATIC PROBE MEASUREMENTS OF VELOCITY DISPLACEMENT AND ELECTRON DENSITY OF PLASMA USING LASER COMPARED WITH MEASUREMENTS USING MICROWAVE INTERFEROMETER A66-28269
- FADEEV, V. V.  
RUBY LASER WITH LIQUID FILTER, CONSIDERING RELATION BETWEEN FILTER EFFICIENCY AND ABSORPTION CURVE PARAMETERS WHEN ACTING AS Q-FACTOR MODULATOR A67-12423
- FAITH, T.  
DIRECT CURRENT PUMPING AND COMBINED MICROWAVE ELECTRON-CYCLOTRON RESONANCE WITH DIRECT CURRENT PUMPING EFFECTS ON DISCHARGE BEHAVIOR AND ARGON LASER OPERATION REPT.-2 N66-29240
- FAITH, T. J., JR.  
HIGH CURRENT DISCHARGE EFFECT ON MAGNETICALLY CONFINED ARGON LASER A67-10012
- FARKAS, GY.  
HIGH POWER LASER BEAM POLARIZATION DIRECTION EFFECTS ON ELECTRON EMISSION FROM AG SURFACE A67-18759
- FARNHAM, K. A.  
MAGNITUDE AND PHASE OF COMPLEX SPATIAL COHERENCE OF HE- NE LASER BEAM A66-26334
- FAUST, W. L.  
SUM AND DIFFERENCE FREQUENCY MIXING OF VISIBLE AND IR GAS LASER LIGHT IN GA P AT NEAR RESTSTRAHL FREQUENCIES AND RELATIONSHIP TO SPONTANEOUS RAMAN SCATTERING A67-15464
- FANCETT, B. C.  
X UV C, TI, MN, FE, NI, CU, ZN AND AR LINE SPECTRA AND CONTINUUM RADIATION SPECTRA IN PLASMAS PRODUCED BY FOCUSED RUBY LASER BEAM A66-39812
- FECAN, J.-C.  
TRANSMISSION OF LUMINOUS FLUX DUE TO IONIZATION OF GASES BY HIGH POWER LASER, MEASURING ENERGY ABSORPTION IN IONIZED ZONE A66-36255
- FEDOSEEV, K. P.  
INDIUM ARSENIC ANTIMONIDE SINGLE CRYSTALS IN P-N JUNCTION LASER A66-31767
- INDIUM ARSENIC ANTIMONIDE SINGLE CRYSTALS IN P-N JUNCTION LASER A67-10087
- FEIN, M. E.  
SPATIALLY RESOLVED HE- NE LASER HETERODYNE MEASUREMENTS OF ELECTRON NUMBER DENSITIES IN WEAKLY IONIZED AR PULSED DISCHARGES A67-17272
- FEKETE, D.  
ELLIPTIC CAVITY DESIGN FOR SOLID STATE LASERS, DISCUSSING MULTIPLE REFLECTIONS, ABSORPTION COEFFICIENT, REFRACTION LOSSES, ETC A66-25998
- FELD, M. S.  
OPTICAL- AND I R-MASER SPECTROSCOPY OF INHOMOGENEOUSLY BROADENED RESONANCES, USING GAS LASERS A66-26196
- FELDMAN, J. M.  
IMPURITY CONCENTRATION EFFECT ON MAXIMUM CONTINUOUS WAVE POWER FROM GALLIUM ARSENIDE LASERS AT 77 DEGREES K A66-37782
- CONDUCTIVITY MODULATION BY HEAVY-TO-LIGHT HOLE TRANSITIONS IN P-TYPE GERMANIUM NOTING CARRIER LIFETIME AND RINGING OF LASER PULSE A66-42249
- FELPERIN, K. D.  
SPATIAL SELECTIVE FADING AS RANDOM PROCESS, DISCUSSING SPATIAL COHERENCE, WAVE NUMBER DISPERSION PROFILE, TIME DELAY PROFILE, ETC, IN IONOSPHERIC PROPAGATION A66-26859
- FENCIL, C. R.  
DIGITAL-MODE FM CW LASER RANGING AND TRACKING SYSTEM USING COMPOUND AXIS SERVOMECHANISM A66-25982
- FENNER, G. E.  
ELECTRON BEAM SPATIAL SCANNING OF COHERENT EMISSION OF GA AS JUNCTION LASER AT LOW TEMPERATURES, MAKING CURRENT DISTRIBUTION NONUNIFORM A67-18150
- FENNER, N. C.  
LASER VAPORIZATION AND IONIZATION OF SOLID MATERIALS TO OBTAIN IONS FOR TIME-OF-FLIGHT MASS SPECTROMETER A66-39385
- FENSTER, P.  
AUDIO FREQUENCY PROPORTIONAL TO ROTATION RATE OF REENRANT LASER CAVITY SYSTEM DERIVED FROM SINGLE

- OUTPUT BEAM A67-11322 A66-31884
- FERDINAND, A. P.  
NANOSECOND PULSE LIGHT SOURCES USED IN FREE FLIGHT  
HYPERSONICS FOR BALLISTIC RANGE MEASUREMENTS,  
NOTING LESS PHOTOGRAPHIC BLURRING OF MOTION A67-18881
- FERRARO, A. J.  
SPECTRAL COMPOSITION OF LASER LIGHT WITHIN  
FRAMEWORK OF THEORY OF NONLINEAR OPTICAL EFFECTS A66-37360
- FILIPESCU, N.  
FLUORESCENCE QUANTUM EFFICIENCIES OF OCTA-  
COORDINATED EUROPIUM HOMOGENEOUS AND MIXED  
CHELATES IN ORGANIC SOLVENTS, NOTING EFFECT OF  
OXYGEN REMOVAL A66-41153
- ORGANIC SENSITIZERS FOR EVALUATION OF TRANSITION  
METAL FLUORESCENCE IN OPTICAL LASER APPLICATION  
NASA-CR-77913 N66-36265
- SYNTHESIS OF MODEL COMPOUNDS AND INTRAMOLECULAR  
ENERGY TRANSFER FOR ORGANIC LASER MATERIALS, AND  
SENSITIVE RARE EARTH FLUORESCENCE IN ORGANIC  
SOLVENTS N67-18123
- FILIPPOVA, M. A.  
RADIATION CONTROL OF RUBY LASER BY DIFFRACTION  
MODULATOR WITH TRAVELING ULTRASONIC WAVE, NOTING  
COMPUTER SOLUTION OF KINETIC EQUATIONS OF  
POPULATION BALANCE, RADIATION DENSITY,  
CHARACTERISTIC DAMPING, ETC A66-33515
- RADIATION CONTROL OF RUBY LASER BY DIFFRACTION  
MODULATOR WITH TRAVELING ULTRASONIC WAVE, NOTING  
COMPUTER SOLUTION OF KINETIC EQUATIONS OF  
POPULATION BALANCE, RADIATION DENSITY,  
CHARACTERISTIC DAMPING, ETC A66-42128
- FINE, S.  
OPTICAL RAY TRACING TO PREDICT FOCUSING  
CHARACTERISTICS OF LASER LIGHT IN REFRACTIVE  
TARGETS, CALCULATING HEATING EFFECTS IN TARGET,  
NOTING TARGET GEOMETRY, REFRACTIVE INDEX,  
THICKNESS OF SKIN LAYERS, ETC A66-25531
- FINK, U.  
BRILLOUIN SPECTRA OF ACETONE, ETHYL ALCOHOL,  
WATER, CARBON BISULFIDE, TOLUENE, AND CARBON  
TETRACHLORIDE USING HELIUM-NEON LASER AND  
PHOTOELECTRIC DETECTION N66-35529
- FIOCCO, G.  
METEOROLOGICAL VARIABLE SENSING BY LASER PROBES  
NASA-CR-77909 N66-36261
- FITZMAURICE, M. W.  
OPTICAL MODULATOR FOR SATELLITE TO GROUND OR  
GROUND TO GROUND LASER COMMUNICATION LINK  
NASA-TM-X-55539 N66-30362
- FLECK, J. A., JR.  
QUANTUM THEORY OF Q-SPOILED LASER, NOTING  
STATISTICS OF NUMBER OF PHOTONS IN MODE BEAR  
QUALITATIVE RESEMBLANCE TO POISSON STATISTICS A66-41373
- MASTER EQUATION SOLVED TO OBTAIN DIAGONAL ELEMENTS  
OF DENSITY MATRIX FOR LASER LIGHT, TAKING INTO  
ACCOUNT PUMPING SCHEME CHARACTERIZING THREE-LEVEL  
LASER A66-41374
- STEADY STATE INTENSITY FLUCTUATIONS AND STATISTICS  
OF LASER OPERATING ABOVE THRESHOLD A67-15776
- FLESHER, G. T.  
MARK I SMASER DESIGN, SUBMILLIMETER WAVE GAS  
LASER CAPABLE OF CONTINUOUS WAVE OR PULSE  
OPERATION A66-29009
- FLEURY, P. A.  
MULTIPHOTON PLASMA PRODUCTION AND STIMULATED  
RECOMBINATION RADIATION IN LEAD TELLURIDE,  
CONSIDERING ELECTRON-HOLE PAIR PRODUCTION RATE
- OPTICAL NONLINEARITIES DUE TO CONDUCTION BAND  
ELECTRONS IN IN AS, IN SB, GA AS AND PB TE  
STUDIED, USING Q-SWITCHED CARBON DIOXIDE LASER  
RADIATION A67-12524
- INELASTIC SCATTERING OF CARBON DIOXIDE LASER  
RADIATION BY MOBILE LANDAU-LEVEL ELECTRONS IN N-  
IN SB A67-17723
- FLIGSTEN, K. E.  
DIFFUSELY TRANSMITTING INTEGRATING SPHERE WITH  
SOLID STATE PHOTODIODE USED IN LASER OUTPUT  
MEASUREMENT A67-10445
- FLINCHBAUGH, D. E.  
FLUORESCENT LIFETIMES OF NEODYMIUM, YTTERBIUM AND  
SAMARIUM INCORPORATED IN ORDERED PEROVSKITE-TYPE  
COMPOUNDS DETERMINED, NOTING CRYSTAL STRUCTURE  
POTENTIAL FOR LASER EMISSION A66-27976
- FLOUX, F.  
TRANSMISSION OF LUMINOUS FLUX DUE TO IONIZATION OF  
GASES BY HIGH POWER LASER, MEASURING ENERGY  
ABSORPTION IN IONIZED ZONE A66-36255
- FLYNN, G. W.  
MOLECULAR GAS LASER Q-SWITCHING TECHNIQUES,  
DETERMINING ROTATIONAL COLLISION SECTIONS FOR  
CARBON DIOXIDE AND CROSS SECTIONS FOR VIBRATIONAL  
RELAXATION A67-16632
- FOLEY, W. L.  
MODULATION AND SCANNING OF COHERENT LIGHT FOR  
APPLICATION TO SIMULATION DISPLAY GENERATION  
AMRL-TR-66-9 N66-39473
- FONG, F. K.  
SOLID STATE REDUCTION OF LANTHANIDE IONS IN LASER  
HOSTS, EFFECT OF PRESENCE OF RECOMBINATION HOLE-  
CENTERS IN PHOTOREDUCTION SAMPLES AND ELIMINATION  
DURING ELECTROCHEMICAL PROCESS A66-27464
- FOREMAN, J. W., JR.  
LASER DOPPLER VELOCIMETER FOR MEASURING LOCALIZED  
FLOW VELOCITIES IN LIQUIDS A66-27053
- LASER DOPPLER VELOCIMETER FOR GAS AND LIQUID FLOW  
VELOCITY MEASUREMENT A66-42557
- FOREST, H.  
DIRECT-EXCITATION LIQUID LASER MEASURED FOR  
QUANTUM EFFICIENCY FLUORESCENCE  
AD-628526 N66-24728
- FORK, R. L.  
MULTIPLE QUANTUM EQUATIONS FOR MODE AMPLITUDE AND  
FREQUENCY DETERMINATION FOR MAGNETIC FIELD-TUNED  
GAS OPTICAL MASER A66-26200
- HYSTERESIS PHENOMENA IN HE- NE GAS LASER IN AXIAL  
MAGNETIC FIELD AND POLARIZATION OF OSCILLATING  
MODE WITHIN CERTAIN TUNING REGION A66-29385
- FORREST, M. J.  
COOPERATIVE SCATTERING OF LASER LIGHT BY THETATRON  
PLASMA A66-35489
- SCATTERED LIGHT SPECTRUM IN THETATRON PLASMA,  
NOTING ONSET OF ION WAVE INSTABILITY A67-10248
- FREQUENCY DISTRIBUTION MEASUREMENTS OF RUBY LASER  
LIGHT SCATTERED BY THETATRON PLASMA  
CLM-P-104 N66-35301
- FORRESTER, P. A.  
LASER LINES DUE TO ENERGY TRANSFER FROM COLOR  
CENTERS TO ERBIUM IONS IN CALCIUM FLUORIDE  
CRYSTALS IRRADIATED BY GAMMA RAY A66-30278
- FOSTER, J. V.  
LASER APPLICATION FOR VIBRATION MEASUREMENT  
UTILIZING DOPPLER SHIFT PRODUCED ON WAVE  
REFLECTED FROM SURFACE VIBRATING NORMAL TO BEAM  
PATH A66-35673

- FOTIADI, A. E.  
EFFECT OF LONGITUDINAL MAGNETIC FIELD ON OUTPUT  
POWER OF GAS LASER OPERATING IN IR SPECTRUM,  
NOTING GAS-MIXTURE PRESSURE IN DISCHARGE TUBE ROLE  
A66-27156
- EFFECT OF LONGITUDINAL MAGNETIC FIELD ON OUTPUT  
POWER OF GAS LASER OPERATING IN IR SPECTRUM,  
NOTING GAS-MIXTURE PRESSURE IN DISCHARGE TUBE  
A66-42977
- FOWLER, V. J.  
LASER BEAM DEFLECTION AND SCANNING TECHNIQUES  
A66-42817
- INTERNALLY SCANNED LASER BEAM HAVING HIGH  
DEFLECTION RATE PRODUCED BY PULSED OPTICAL DELAY  
LINE  
A67-16647
- FOWLES, G. R.  
LASER ACTION ON SEVERAL HYPERFINE TRANSITIONS IN  
MN I  
A66-34000
- PULSED LASER ACTION IN VISIBLE SPECTRUM OF SINGLY  
IONIZED GE, SN, PB, IN, CD AND ZN, LISTING  
TEMPERATURE AND PRESSURE RANGES  
A66-36076
- FRADKIN, E. E.  
OPEN LASER RESONATOR COMPOSED OF TWO IDEALLY  
SPHERICAL MIRRORS WITH RECTANGULAR APERTURE  
A66-29200
- RESONATOR GEOMETRY AND MIRROR POSITIONS AND EFFECT  
ON RADIATION OUTPUT IN HELIUM-NEON LASER  
A66-29201
- OPEN LASER RESONATOR COMPOSED OF TWO IDEALLY  
SPHERICAL MIRRORS WITH RECTANGULAR APERTURE  
A66-33049
- RESONATOR GEOMETRY AND MIRROR POSITIONS AND EFFECT  
ON RADIATION OUTPUT IN HELIUM-NEON LASER  
A66-33050
- GENERATING MODE NUMBER IN SOLID STATE LASERS USING  
TRAVELING WAVE AND STANDING WAVE  
A67-10069
- COMPETITION OF TWO TYPES OF OSCILLATIONS IN  
TRAVELING WAVE LASER  
A67-10362
- COMPETITION OF TWO TYPES OF OSCILLATIONS IN  
TRAVELING WAVE LASER  
A67-17620
- FRANCON, M.  
DEGREE OF COHERENCE OF TWO POINTS ILLUMINATED BY  
PLANE QUASI-MONOCROMATIC SOURCE  
A67-17574
- FRANKEN, P. A.  
CLEAR AIR TURBULENCE DETECTION WITH LASER RADAR,  
NOTING AIRBORNE EQUIPMENT AND RESULTS  
A67-15304
- FRANTZ, L. M.  
NARROW SPECTRAL OUTPUTS FROM ACTIVELY Q-SWITCHED  
LASERS, DERIVING FRACTIONAL ENERGY EXPRESSION FOR  
INJECTED MODE GROUP  
A66-42570
- ATMOSPHERIC HEATING BY LASER PULSES IN  
TRANSMISSION WINDOWS  
TRW-4535-6003-RO-000  
N66-34232
- FRAPARD, C.  
IR LASER RADIATION WITH POWER OF 5.7 WATTS IN  
VICINITY OF 10.69 MU IN SEALED TUBE CONTAINING  
PURE CARBON DIOXIDE EXCITED BY AC OR DC CURRENT  
A66-25410
- FRAPARD, CH.  
HIGH-POWER MOLECULAR LASER BASED ON VIBRATIONAL-  
ROTATIONAL ENERGY LEVEL, NOTING CARBON DIOXIDE-  
NEON-HELIUM LASER DESIGN  
A66-33248
- FRAY, S.  
PHOTON COUNTING DISTRIBUTIONS AND INTENSITY  
FLUCTUATIONS OF MODULATED LASER BEAMS  
A67-20125
- FREED, C.  
PHOTOELECTRON COUNTS OF PHOTOMULTIPLIER  
ILLUMINATED BY GAS LASER LIGHT SOURCE  
A66-26211
- NEAR- BOSE- EINSTEIN PROBABILITY DISTRIBUTION OF  
PHOTOELECTRON COUNTS PRODUCED BY HE- NE GAS LASER  
NARROW BAND GAUSSIAN LIGHT SOURCE OPERATING  
SLIGHTLY BELOW OSCILLATION THRESHOLD  
A66-30645
- PHOTOELECTRON EMISSION STATISTICS DETERMINING  
PROBABILITY DISTRIBUTION OF PHOTOELECTRON COUNTS  
IN PHOTOMULTIPLIER ILLUMINATED BY LASER BELOW AND  
ABOVE THRESHOLD OF OSCILLATION  
A66-42543
- FREIBERG, R. J.  
RADIATIVE CASCADE PATTERNS IN HELIUM-NEON GAS  
SYSTEM USING IDEALIZED MODEL, COMPUTING  
SPONTANEOUS DECAYS WHICH ARE COMPARED WITH LASER  
EXPERIMENTS  
A66-28699
- FREIDMAN, G. I.  
TRUNCATED EQUATIONS DESCRIBING COHERENT RADIATION  
OF EXCITED CHROMIUM IONS IN RUBY SITUATED IN  
TRAVELING WAVE RESONATOR  
A66-31547
- FREQUENCY SPECTRUM OF LASER IMPULSE IN Q-  
SWITCHING REGIME WIDER THAN THAT OF SINGLE IMPULSE  
RADIATED BY LASER IN ORDINARY REGIME  
A66-37141
- SPONTANEOUS EMISSION SPECTRA AND RATIO OF NUMBER  
OF PHOTONS IN VARIOUS OSCILLATION MODES OF LASER  
WITH NONLINEAR FILTER TYPE LOCK  
A67-11573
- FRENCH, J. M.  
OPERATION AND IMPROVEMENT OF FREQUENCY MODULATED  
AND SUPER-MODE LASERS  
IER-3  
N66-30672
- AUTOMATIC FREQUENCY CONTROL SYSTEM FOR ABSOLUTE  
FREQUENCY STABILIZATION  
IER-5  
N67-15312
- FRIDRIKHOV, S. A.  
EFFECT OF LONGITUDINAL MAGNETIC FIELD ON OUTPUT  
POWER OF GAS LASER OPERATING IN IR SPECTRUM,  
NOTING GAS-MIXTURE PRESSURE IN DISCHARGE TUBE ROLE  
A66-27156
- LONGITUDINAL MAGNETIC FIELD EFFECT UPON GAS  
DISCHARGE, ZEEMAN EFFECT AND FARADAY EFFECT IN  
HE- NE GAS LASER  
A66-40586
- EFFECT OF LONGITUDINAL MAGNETIC FIELD ON OUTPUT  
POWER OF GAS LASER OPERATING IN IR SPECTRUM,  
NOTING GAS-MIXTURE PRESSURE IN DISCHARGE TUBE  
A66-42977
- GAS LASER BEHAVIOR IN MAGNETIC FIELD, ANALYZING  
DATA ON MAGNETIC EFFECT, ZEEMAN EFFECT AND  
MICROWAVE PUMPING  
A67-18168
- PRESSURE DEPENDENCE OF OUTPUT POWER OF HE- NE  
LASER ON AMPLITUDE OF PERIODIC HIGH VOLTAGE  
EXCITATION PULSES  
A67-18784
- FRIED, D. L.  
CAT DETECTION FROM DOPPLER SHIFT IN LASER LIGHT  
BACKSCATTERED FROM ATMOSPHERIC AEROSOL  
A66-28930
- DOPPLER LASER RADAR SYSTEM FOR DETECTION OF CLEAR  
AIR TURBULENCE  
SID-66-450  
N66-35122
- PROGRAM SPECIFICATIONS FOR LASER SPACE  
COMMUNICATION STUDY  
NASA-CR-78856  
N66-39447
- FRISCH, H. L.  
MULTIPHOTON PLASMA PRODUCTION AND STIMULATED  
RECOMBINATION RADIATION IN LEAD TELLURIDE,

CONSIDERING ELECTRON-HOLE PAIR PRODUCTION RATE  
A66-31884

FROELICH, H.-J.  
X-BAND RUBY MASER DESIGN WITH LIQUID HYDROGEN  
COOLING FOR HIGH GAIN AT LOW PUMPING POWER  
A67-19131

FROEHL, C.  
HOLOGRAPHIC STUDY OF SECOND HARMONIC WAVE EMITTED  
BY RUBY LASER, EXAMINING INFLUENCE OF DEFECTS OF  
SPATIAL COHERENCE OF WAVE  
A67-17322

FROHN, A.  
FIZEAU FRINGES PRODUCED IN LASER ILLUMINATED  
FABRY-PEROT INTERFEROMETER TO OBTAIN  
CONCENTRATION PROFILES IN TURBULENT AND LAMINAR  
JETS  
A67-17371

FUJII, Y.  
CURRENT MEASURING DEVICE FOR EHV TRANSMISSION  
LINE, OBTAINING INSTANTANEOUS MAGNETIC FIELD BY  
GAUGING FARADAY ROTATION ANGLE OF LASER BEAM IN  
FLINT GLASS ROD  
A66-42556

FUKUI, T.  
PULSED LASER OPERATION IN WEDGE-SHAPED RUBY ROD  
AT ROOM TEMPERATURE  
A66-29415

FULTON, J. F.  
ATOMIC BEAM PREPARATION TECHNIQUES FOR HYDROGEN  
MASER OPERATION WITH UNPOLARIZED ATOMS  
ECOM-2720  
N66-38178

FUNABIKI, K.  
HIGH TEMPERATURE FLOW CHARACTERISTICS IN FREE  
PISTON SHOCK TUBE MEASURED BY MEANS OF PULSED  
LIGHT OF HE-NE GAS LASER  
A66-35353

FURSIKOV, M. M.  
CALCIUM FLUORIDE-CERIUM FLUORIDE WITH NEODYMIUM  
ADDITIONS AS ACTIVE MEDIUM FOR LASERS, DISCUSSING  
ABSORPTION AND LUMINESCENCE SPECTRA AND INDUCED  
RADIATION  
A67-16922

FUTAMI, K.  
PULSED LASER OPERATION IN WEDGE-SHAPED RUBY ROD  
AT ROOM TEMPERATURE  
A66-29415

## G

G., E. B.  
INVESTIGATIONS OF HIGH POWER LASER RADIATION  
INTERACTION WITH SURFACES USING QUADRUPOLE AND  
TIME-OF-FLIGHT MASS SPECTROMETERS  
AD-636680  
N66-38247

GABOR, D.  
HOLOGRAPHY PRINCIPLES AND DEVELOPMENT, CONSIDERING  
WAVE FRONT RECONSTRUCTION, LIPPMANN PHOTOGRAPHY,  
LASER LIGHT, APPLICATION TO TV, ETC  
A66-35244

GABRIEL, A. H.  
X UV C, TI, MN, FE, NI, CU, ZN AND AR LINE  
SPECTRA AND CONTINUUM RADIATION SPECTRA IN PLASMAS  
PRODUCED BY FOCUSED RUBY LASER BEAM  
A66-39812

GABRIEL, G. J.  
SCATTERING OF PARTIALLY COHERENT RADIATION BY  
NEUTRAL MOLECULES FORMULATED AS RANDOM PROCESS  
A67-12096

GADDY, O. L.  
SELF-LOCKING MODES IN ARGON ION LASER, OBSERVING  
SUBNANOSECOND PULSATION OF LASER OUTPUT WITH  
WIDEBAND PHOTOMULTIPLIER  
A67-12503

GALAKTIONOVA, N. M.  
EFFECT OF ANOMALOUS DISPERSION ON STIMULATED  
EMISSION SPECTRUM OF DOPED CADMIUM FLUORIDE  
CRYSTALS  
A66-32317

GALASSO, F. S.  
FLUORESCENT LIFETIMES OF NEODYMIUM, YTTERBIUM AND  
SAMARIUM INCORPORATED IN ORDERED PEROVSKITE-TYPE  
COMPOUNDS DETERMINED, NOTING CRYSTAL STRUCTURE  
POTENTIAL FOR LASER EMISSION  
A66-27976

GALEEV, I. A.  
LEAD AZIDE AND PENTAERYTHRIT TETRANITRATE  
EXPLOSION TRIGGERED BY LASER RADIATION  
A67-19315

GALKIN, G. N.  
PHOTO EMF VARIATION WITH RADIATION POWER OF  
Q-SWITCH RUBY LASER INCIDENT ON SILICON CRYSTAL  
WITH P-N JUNCTION  
A66-32509

GALKIN, L. N.  
MOLECULAR SPECTROSCOPY OF ILLUMINATION EFFECTS ON  
COBALT ACTIVATED ZN S EXPOSED TO RUBY LASER  
PULSES  
A67-10683

GAMBLING, W. A.  
LOSS MEASUREMENT FOR RUBY LASER RESONANT CAVITY,  
COMPARING THRESHOLDS FOR R SUB 1 AND R SUB 2  
LINE OPERATION  
A67-16655

GAMMARINO, R. R.  
HIGH CURRENT SOLID STATE PULSER USED TO DRIVE  
INJECTION LASER FOR ROOM TEMPERATURE OPERATION  
ECOM-2753  
N67-15343

GANAPOLSKII, E. M.  
FREQUENCY TEMPERATURE DEPENDENCE OF LONGITUDINAL  
AND TRANSVERSE HYPERSONIC WAVE ABSORPTION  
COEFFICIENTS IN QUARTZ AND ARTIFICIAL RUBY CRYSTAL  
A66-42514

GANDY, H. W.  
LASER ACTION IN TRIPLY ACTIVATED BARIUM CROWN  
GLASS  
N66-28515

ENERGY TRANSFER IN ACTIVATED GLASSES AND HIGH  
POWER LASER EMISSION  
N67-12646

GAPONOV, A. V.  
AUTOMODULATION OF EMISSION FROM SOLID STATE LASER  
A66-26041

GARDASHYAN, V. M.  
FLUX VELOCITY, CRYSTAL QUALITY AND DIAMETER,  
DISTRIBUTION OF CHROMIUM IONS, AND OTHER FACTORS  
CONSIDERED IN DESIGN OF RUBY LASER OPTICAL  
GENERATOR  
N66-37713

GARDNER, J. W.  
REPLACEMENT OF POISSON BY POLYA DISTRIBUTION IN  
CALCULATING LASER INTENSITY THRESHOLD NECESSARY TO  
INDUCE IONIZATION BREAKDOWN IN GASES  
A66-39715

POLYA DISTRIBUTION DESCRIBING PHOTON CORRELATIONS  
IN IONIZING LASER BEAMS ENABLES DIFFERENTIATION  
BETWEEN VARIOUS MULTIPHOTON IONIZATION PROCESSES  
A67-13982

GARNIRE, E.  
PROPERTIES OF SELF-TRAPPED LIGHT FILAMENTS NOTING  
STIMULATED RAMAN EMISSION AND CREATION,  
CONTAINMENT AND TERMINATION MECHANISMS  
A67-16648

NEW CLASS LIGHT FILAMENT IDENTIFIED IN RAMAN  
RADIATION OF INTENSE RUBY LASER BEAM  
NASA-TM-X-57831  
N66-33863

GARRETT, C. G. B.  
FAR-IR LASER MOLECULAR SPECTROSCOPY INCLUDING IR  
LASER OSCILLATORS, PHOTON NOISE, DETECTORS AND  
NUCLEAR OPTICS  
A66-26195

GARSCADDEN, A.  
CATAPHORESIS, MOVING STRIATIONS AND ASSOCIATED  
NOISE IN HE-NE LASER  
A66-26591

CURRENT CHANGES IN GAS DISCHARGE AS AFFECTED BY  
LASING ACTION  
A66-27055

GARVEY, J. O.  
PROGRAM PLANNING, GROUND SUPPORT AND AIRBORNE  
EQUIPMENT FOR LASER SPACE COMMUNICATION SYSTEM  
NASA-CR-78855  
N66-39446

GEBBIE, H. A.  
MULTIPLE CYCLOTRON RESONANCE ABSORPTION LINES IN  
DEGENERATE VALENCE BANDS OF GE SEMICONDUCTOR

- STUDIED WITH FAR IR LASER SUBMILLIMETER SPECTROMETER A66-42545
- GEETS, V. I.  
LASER Q-FACTOR MODULATION BY SPECTRAL ABSORPTION FILTERS WITH INVERSE BLEACHING A66-29354
- RUBY LASER PUMPING THRESHOLD ENERGY, DIVERGENCE ANGLE AND OUTPUT POWER AS AFFECTED BY RESONATOR LENGTH A66-39769
- RUBY LASER PUMPING THRESHOLD ENERGY, DIVERGENCE ANGLE AND OUTPUT POWER AS AFFECTED BY RESONATOR LENGTH A67-12855
- GEIL, E.  
PULSED ARC XENON DISCHARGES USED FOR OPTICAL PUMPING OF HIGH ENERGY LASERS AD-632892 N66-31537
- GELLER, M.  
PULSED COAXIAL TRANSMISSION LINE NITROGEN GAS LASER, NOTING PRESSURE EFFECT A66-40107
- GENKIN, V. N.  
DEGREE OF EXCITATION OF METASTABLE STATE DETERMINED, USING LUMINESCENCE SATURATION PHENOMENON, CALCULATING POPULATION OF WORKING LEVEL OF LASER SUBSTANCE A66-30846
- GENNER, R.  
FERRIC-DOPED-RUTILE 8 MM TRAVELING WAVE MASER, NOTING OPERATING RANGE AND PERFORMANCE CHARACTERISTICS A67-13986
- GEORGE, E. W.  
LASER DOPPLER VELOCIMETER FOR GAS AND LIQUID FLOW VELOCITY MEASUREMENT A66-42557
- GEORGE, N.  
FARADAY ROTATION OBTAINED WITH PULSED HIGH-FIELD MAGNETS FOR CONTROLLING LASER CAVITIES A66-35380
- EXCESS PHOTON NOISE IN DETECTED PHOTOCURRENT OF MULTIMODE LASER FOR UNCOUPLED AND PHASE LOCKED MODES A67-16623
- FARADAY ROTATORS FOR HIGH POWER LASER CAVITIES N66-36914
- GERARDO, J. B.  
ELECTRON AND NEUTRAL ATOM DENSITIES IN HELIUM AND ARGON AFTERGLOW PLASMA OBTAINED BY TWO HELIUM-NEON LASER INTERFEROMETERS, NOTING TEMPORAL DEPENDENCE OF ELECTRON DECAY A66-41364
- HELIUM-NEON LASER INTERFEROMETERS TO OBTAIN ELECTRON AND NEUTRAL ATOM DENSITIES IN HELIUM AND ARGON AFTERGLOW PLASMAS AROD-4832-7 N66-25866
- PLASMA DIAGNOSTICS WITH THREE-MIRROR GAS LASER INTERFEROMETER N67-15241
- GERRITSEN, H. J.  
ORGANIC GAS MAGNETICALLY TUNED LASER SPECTROSCOPY, DISCUSSING RESOLUTION, ABSORPTION SPECTRA AND VIBRATIONAL DEACTIVATION A66-26197
- LASER SPECTROSCOPY, DISCUSSING ADVANTAGES, PRECISION ATTAINABLE, LINE SHAPE AND POSITION MEASUREMENTS A67-19087
- GERRY, E. T.  
PULSED NITROGEN LASER DELIVERING HIGH AVERAGE POWER WITHOUT COMPLICATIONS OF CONVENTIONAL Q-SWITCHING A66-38266
- GEUSIC, J. E.  
NEODYMIUM DOPED YAG CRYSTAL AND LITHIUM META NIOBATE AS CW LASER MATERIALS AND POTASSIUM TANTALUM NIOBATE AS OPTICAL MODULATOR MATERIAL A66-25518
- NEODYMIUM-DOPED YTTRIUM-ALUMINUM GARNET CRYSTAL LASER OSCILLATOR AS REGENERATIVE AMPLIFIER OF NOISE A66-26212
- COHERENT EMISSION FROM TRIVALENT HOLMIUM IONS IN RARE EARTH SUBSTITUTED YTTRIUM ALUMINUM GARNET, NOTING THREE ENERGY TRANSFER COMBINATIONS IN YAG A66-28690
- ULTRASHORT OPTICAL PULSES GENERATED BY MODE LOCKING CONTINUOUS NEODYMIUM DOPED YTTRIUM-ALUMINUM GARNET LASER A66-29391
- GIGLIO, M.  
COUPLING MECHANISM IN PASSIVE Q-SWITCHING OPERATION BETWEEN FILAMENTS AT DIFFERENT REGIONS OF RUBY LASER ROD A67-10813
- GILLESPIE, L. F.  
GATED LASER NIGHT-VIEWING SYSTEM, CALCULATING APPARENT ILLUMINANCE AS FUNCTION OF TARGET DISTANCE A66-36938
- GILMOUR, A. S., JR.  
ION CURRENT PRODUCED BY ILLUMINATING MATERIALS WITH FOCUSED OUTPUT OF PULSED RUBY LASER NASA-CR-54154 N66-28382
- GINTHER, R. J.  
LASER ACTION IN TRIPLY ACTIVATED BARIUM CROWN GLASS N66-28515
- ENERGY TRANSFER IN ACTIVATED GLASSES AND HIGH POWER LASER EMISSION N67-12646
- GINTOFT, R. I.  
MAXIMUM OUTPUT POWER FROM RUBY LASER AS FUNCTION OF PUMPING FOR SEVERAL INTERFEROMETER BASE VALUES TG-230-T479 N66-37072
- GIORDMAINE, J. A.  
PARAMETRIC OSCILLATOR THEORY APPLIED TO TUNABLE COHERENT OPTICAL PARAMETRIC OSCILLATION IN LITHIUM NIOBATE A66-26145
- GIRES, F.  
SATURABLE OPTICAL ABSORPTION OF LIGHT FLUX FROM HIGH INTENSITY Q-SWITCHED RUBY LASER A67-16677
- GIUA, P. E.  
ULTRASONIC CELL WHICH MODULATES INTENSITY OF HE- NE LASER BEAM FOR COMMUNICATION OF INTELLIGENCE A66-34059
- GIULIANO, C. R.  
SATURABLE DYES NOTING MODE SELECTION PROPERTIES AND ABSORPTION SPECTRA IN BLEACHED STATE A66-42253
- GLADKII, B. I.  
I- V CHARACTERISTIC OF GA AS DIODE WITH FABRY-PEROT RESONATOR, NOTING VARIATIONS DURING AMPLIFICATION TO GENERATION TRANSITION A67-15132
- GOERLICH, P.  
PHOTOELECTRONIC COMPONENTS AND ELECTRONIC MEASUREMENT TECHNIQUES IN RECEPTION AND DEMODULATION OF HF MODULATED LASER BEAMS A67-10300
- GOEROG, I.  
MAGNETICALLY COMPRESSED PLASMA AS HIGH INTENSITY SOURCE OF NEAR UV AND VISIBLE RADIATION EXPERIMENTALLY STUDIED IN DYNAMIC PINCH A67-11880
- GOLANT, M. B.  
SUBMILLIMETER WAVELENGTH ELECTRONIC DEVICES, EXAMINING DEVELOPMENT OF LASERS AND REFLECTED WAVE TUBES WITH OVERLAPPING EFFECTIVE WAVE RANGE A66-38004
- SUBMILLIMETER WAVELENGTH ELECTRONIC DEVICES, EXAMINING DEVELOPMENT OF LASERS AND REFLECTED WAVE TUBES WITH OVERLAPPING EFFECTIVE WAVE RANGE A67-17168
- GOLD, T.  
STIMULATED EMISSION PROCESSES INTERPRETING OH MICROWAVE EMISSION FROM POINTS IN SKY, USING

- ANISOTROPIC UV RADIATION WHICH LEADS TO  
MOLECULE ALIGNMENT AND POPULATION INVERSION  
A66-37343
- GOLDIN, I. U. A.**  
RUBY AND NEODYMIUM GLASS LASERS SUM FREQUENCY  
GENERATION USING NONLINEAR ELECTRO-OPTICAL KDP  
CRYSTAL  
A67-17754
- GOLDMAN, L.**  
PARTIAL INHIBITION OF LASER REACTION IN MAN BY  
TOPICAL CORTICOSTEROIDS  
A67-80434
- GOLDSBOROUGH, J. P.**  
PULSED TOROIDAL EXCITATION OF GAS ION LASERS  
EXTENDED TO DRIVE HIGH POWER CW LASER TRANSITIONS  
IN AR, KR, CL AND BR, NOTING OPERATING  
PARAMETERS AND POWER OUTPUT  
A66-28877
- CYCLOTRON RESONANCE EXCITATION OF UPPER LEVEL OF  
GAS-ION LASER  
A66-31937
- GOLDSTEIN, A.**  
OPTICAL TRANSMISSION OF PLASMA COLUMN GENERATED BY  
IONIZED GAS EXPLOSION DETERMINED, USING LASER BEAM  
A66-42998
- GOLDSTEIN, I.**  
TRAVELING WAVE RUBY LASER AS RADAR TRANSMITTER  
NOTING POWER GAIN, COHERENCE, FREQUENCY SHIFT AND  
SINGLE MODE OF OPERATION  
A67-16657
- GOLDSTEIN, J.**  
CIRCULARLY POLARIZED LASER MODES IN RUBY LASER  
MATERIAL  
N67-17277
- GOLDSTEIN, L.**  
SPECTROSCOPIC AND MICROWAVE INVESTIGATION OF  
LASERING PLASMAS, ELECTRON GAS, AND EXCITED  
STATE POPULATIONS OF ACTIVE MEDIUM  
AFCRL-66-89  
N66-26570
- GOLOSOV, V. V.**  
HELIUM-NEON LASER ASSESSMENT AS SOURCE IN HIGH  
PRECISION RANGE MEASUREMENTS  
A66-35362
- GOLTS, E. I. A.**  
PUMPING MEDIUM POWER LASERS USING ARTIFICIAL  
METEORS TO PRODUCE INTENSE GAS GLOW IN COMPRESSION  
WAVE  
A67-17757
- GOLUBEV, G. P.**  
FORCED EMISSION FROM ELECTRON-EXCITED CADMIUM  
SELENIDE  
A66-35788
- GONCHARENKO, A. M.**  
PROPERTIES OF FINITE CYLINDRICAL DIELECTRIC  
RESONATOR - LASER OPTICS  
TG-230-T465  
N66-34543
- BEHAVIOR OF CIRCULAR DIELECTRIC RESONATOR UNDER  
SOME CRITICAL OPERATING CONDITIONS  
TG-230-T475  
N66-34783
- PARTIALLY COHERENT LIGHT DIFFRACTION CALCULATIONS  
APPLIED TO RUBY LASER RADIATION  
TG-230-T478  
N66-37071
- GONCHAROV, I. G.**  
HELIUM-NEON LASER MODULATION BY POSITIVE AND  
NEGATIVE VOLTAGE PULSES  
A66-31559
- GONCHAROV, V. A.**  
PERFORMANCE OF GA AS SEMICONDUCTOR LASER WITH  
RESONATOR, NOTING DEPENDENCE OF FORBIDDEN ZONE  
WIDTH AND ABSORPTION COEFFICIENT ON FREE CARRIER  
CONCENTRATION AND INCIDENT PHOTON ENERGY  
A66-38955
- PERFORMANCE OF GA AS SEMICONDUCTOR LASER WITH  
RESONATOR, NOTING DEPENDENCE OF FORBIDDEN ZONE  
WIDTH AND ABSORPTION COEFFICIENT ON FREE CARRIER  
CONCENTRATION AND INCIDENT PHOTON ENERGY  
A67-15759
- SEMICONDUCTOR GALLIUM-ARSENIDE LASER WITH FLAT  
RESONATOR  
N66-36291
- GONCHUKOV, S. A.**  
NE- HE LASER OUTPUT DEPENDENCE ON PRESSURE AND  
NONEXCITED ATOM CONCENTRATION  
A66-34696
- NE- HE LASER OUTPUT DEPENDENCE ON PRESSURE AND  
NONEXCITED ATOM CONCENTRATION  
A67-10512
- GONDA, T.**  
THRESHOLD CURRENT DENSITY DEPENDENCY ON PHOTON  
ENERGY IN GALLIUM ARSENIDE LASER DIODES  
A67-13480
- GOOCH, G.**  
SCANNING ELECTRON MICROSCOPE TO EXAMINE CRYSTAL  
MOAIC STRUCTURES AND LASING PROPERTIES OF GALLIUM  
ARSENIDE LASER DIODES  
A66-33300
- GOOT, G. V. D.**  
LASER ACTION IN CLOSED MOLECULAR SYSTEM WITH  
MIXTURE OF CARBON DIOXIDE, NITROGEN AND WATER  
VAPOR, NOTING COUPLING-OUT PLATE REFLECTIVITY AND  
POPULATION INVERSION  
A66-35433
- GORBUNKOV, V. M.**  
SPATIAL DISTRIBUTION OF ELECTRICAL FIELD OBTAINED  
BY FOCUSING RADIATION OF RUBY LASER  
A66-25967
- GORDEEV, D. V.**  
HELIUM-NEON LASER ASSESSMENT AS SOURCE IN HIGH  
PRECISION RANGE MEASUREMENTS  
A66-35362
- GORDON, E. I.**  
ELECTRON IMPACT EXCITATION MECHANISM OF ARGON-ION  
CONTINUOUS AND LONG PULSE LASERS  
A66-26206
- GORDON, J. P.**  
OPTICAL COMMUNICATION USING LASER TECHNIQUES  
A66-26918
- GORMEZANO, E.**  
LASER BEAM TECHNIQUES FOR STUDY OF PLASMAS WITH  
HIGH ELECTRON DENSITIES  
A66-26822
- GORMEZANO, G.**  
PRODUCTION OF NEUTRAL OR IONIZED GAS PLASMOIDS BY  
FOCUSING BEAM OF COHERENT LIGHT EMITTED BY RUBY  
LASER ON TARGET OF PURE METAL OR METAL CONTAINING  
GAS  
A66-26819
- GORODETSKIY, A. A.**  
BIOLOGICAL EFFECTS AND DOSIMETRY OF ABSORBED  
RADIATION FROM RUBY LASER  
N66-37710
- GOROG, I.**  
DEGRADATION OF CONTINUOUS ARGON LASER PERFORMANCE  
WHEN POSITIONED IN AXIAL MAGNETIC FIELD, NOTING  
ROLE OF QUENCHING, RADIATION TRAPPING AND  
EXCITATION MECHANISMS  
A66-37779
- ELECTRO-OPTIC INTRA-CAVITY COLOR SWITCHING IN  
KRYPTON ION FABRY-PEROT LASER  
A67-17888
- GOTHE, K.-H.**  
X-BAND RUBY MASER DESIGN WITH LIQUID HYDROGEN  
COOLING FOR HIGH GAIN AT LOW PUMPING POWER  
A67-19131
- GOUBAU, G.**  
LASER COMMUNICATION BY OPTICAL BEAM WAVEGUIDE  
A66-30594
- GOULD, G.**  
C W IR LASER OSCILLATION IN ATOMIC CL IN H CL  
AND HI GAS DISCHARGES, NOTING USE OF TWO POWER  
SUPPLIES AND ENERGY LEVEL DIAGRAM  
A66-28880
- ALUMINA HIGH TEMPERATURE GAS DISCHARGE TUBE FOR  
INVESTIGATION OF PULSED METAL VAPOR LASER  
OSCILLATIONS  
A66-35810
- PULSED GAS DISCHARGE LASERS NOTING REQUIRED  
ENERGY LEVEL FOR MAXIMUM EFFICIENCY, EXPERIMENTAL  
TECHNIQUES AND RESULTS  
A67-16650

- GOULD, R. W.  
RADIO ELECTRONICS, DISCUSSING QUANTUM ELECTRONICS,  
LASERS, MICROWAVE DEVICES AND TECHNOLOGY, PLASMA  
PHYSICS, ETC A67-18072
- GRABMAIER, J.  
ETCHING METHODS TO VISUALIZE LATTICE DISLOCATIONS  
AND GRAIN BOUNDARIES IN CZOCHRALSKI GROWN CALCIUM  
TUNGSTATE CRYSTALS DOPED WITH NEODYMIUM FOR LASER  
APPLICATION A67-19565
- GRAFSTEIN, D.  
DIRECT-EXCITATION LIQUID LASER MEASURED FOR  
QUANTUM EFFICIENCY FLUORESCENCE  
AD-628526 N66-24728
- GRANITSAS, G. A.  
HOMOGENIZING METHODS FOR PLATINUM-FREE LASER  
GLASS, AND MELTING OF HIGH-PURITY LASER GLASS IN  
ALL-CERAMIC SYSTEM  
SATR-3 N66-30525
- GRANT, J. M.  
DEGREE OF COHERENCE OF OPTICAL BEAM TRAVERSING  
ATMOSPHERIC MEDIUM INCLUDING SIMULATED FOG FOR  
DESIGN OF OPTICAL HETERODYNE RECEIVER  
NASA-CR-76078 N66-29972
- GRASIUK, A. Z.  
ADJUSTMENT PROCEDURE FOR LASER WITH POLYGONAL  
RESONATOR, NOTING SPATIAL MIRROR ADJUSTMENT IN  
ADDITION TO ANGULAR ADJUSTMENT A66-25323
- SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-  
PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION  
A66-27187
- GENERATION IN CADMIUM SULFIDE DURING TWO-PHOTON  
OPTICAL EXCITATION BY RUBY LASER WITH MODULATED  
Q-FACTOR A66-33134
- SPECTRAL CHARACTERISTICS OF TWO-PHOTON OPTICAL  
EXCITATION AND LIGHT EMISSION FROM CD SE  
SEMICONDUCTOR LASER WITH MODULATED Q-FACTOR  
A66-37565
- SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-  
PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION  
A66-43085
- ADJUSTMENT PROCEDURE FOR LASER WITH POLYGONAL  
RESONATOR, NOTING SPATIAL MIRROR ADJUSTMENT IN  
ADDITION TO ANGULAR ADJUSTMENT A67-10162
- SPECTRAL CHARACTERISTICS OF TWO-PHOTON OPTICAL  
EXCITATION AND LIGHT EMISSION FROM CD SE  
SEMICONDUCTOR LASER WITH MODULATED Q-FACTOR  
A67-15299
- SEMICONDUCTOR LASERS WITH RADIATING MIRRORS  
DEVELOPED BY EXCITATION, USING ELECTRON BEAM AND  
NEODYMIUM LASER GLASS RADIATION  
A67-16669
- SEMICONDUCTOR LASERS USING SINGLE AND DOUBLE  
PHOTON OPTICAL EXCITATION A67-18930
- GRASYUK, A. Z.  
DESCRIPTION OF RUBY LASER USED IN OPTICAL LOCATION  
OF MOON  
NASA-TT-F-8866 N66-29428
- GRAU, G. K.  
LASER MIRROR DESIGN IN LENS FORM FOR DECOUPLING  
DIFFRACTION LIMITED PARALLEL BEAM, BASED ON  
THEOREMS CONCERNING GAUSSIAN BEAM IMAGING AND  
BEHAVIOR A67-17327
- GREENWOOD, I. A.  
CESIUM VAPOR USED FOR TRANSFORMER LASER TO BE  
OPTICALLY PUMPED BY BATTERY OF NEODYMIUM LASERS  
GPL-A-31-3 N66-33813
- GREG, D. W.  
Q-SWITCHING LASER SYSTEM TO OBTAIN SIMULTANEOUS  
GIANT PULSES FROM FIVE RUBY LASER OSCILLATORS  
A66-42302
- GREGG, D. W.  
MOMENTUM TRANSFER CAUSED BY FOCUSING LASER GIANT  
PULSE ON SURFACE IN VACUUM INVESTIGATED FOR BE,  
C, AL, ZN, AG AND W A66-35418
- LASER GIANT PULSE DAMAGE TO DIELECTRIC MIRROR  
COATINGS IMMersed IN NITROBENZENE SOLUTION  
A66-36075
- KINETIC ENERGIES OF IONS PRODUCED BY GIANT LASER  
PULSES, NOTING DEPENDENCE OF MEAN SQUARE ION  
VELOCITY ON PULSE PEAK INTENSITY  
A67-15099
- GREGORY, J. G.  
COMMUNICATION SYSTEM RESEARCH ON HYDROGEN MASER,  
SOLID STATE IMAGE CONVERTER, AND TELEMETRY  
SIGNAL PROPAGATION  
NASA-TM-X-53535 N67-16724
- HYDROGEN MASER POTENTIAL AS STABLE FREQUENCY  
REFERENCE FOR PRECISION TRACKING SYSTEMS  
N67-16725
- GREMMELMAIER, R.  
GALLIUM ARSENIDE LASER DIODE CHARACTERISTICS  
A66-25112
- GRESSER, H.  
LASER OUTPUT ENERGY CONTROLLER HAVING EIGHT-TO-ONE  
IMPROVEMENT IN PULSE REPEATABILITY IN SOLID STATE  
LASERS A66-36034
- GRIZANOV, I. U. M.  
Q-FACTOR MODULATION OF RUBY-LASER RESONATOR BY  
PHTHALOCYANINE SERIES A66-29353
- Q-FACTOR MODULATION OF RUBY-LASER RESONATOR BY  
PHTHALOCYANINE SERIES A66-37358
- GRIBBLE, R. F.  
HIGH-TEMPERATURE RESEARCH WITH INFRARED MASER FOR  
TIME-SPACE RESOLVED DIAGNOSTICS OF DEUTERIUM  
PLASMAS  
ARL-65-270 N66-30302
- GRIBKOVSKII, V. P.  
SPLITTING OF METASTABLE LEVEL OF THREE-LEVEL RUBY  
LASER  
TG-230-T467 N66-34267
- GRIGOREV, I. U. V.  
SINGLE MODE APPROXIMATION OF PARAMETRIC EXCITATION  
AND SELF-EXCITATION OF OSCILLATIONS IN FABRY-  
PEROT RESONATOR FILLED WITH NONLINEAR DISPERSIVE  
MEDIUM A67-11575
- GRIGORIANTS, V. V.  
RESONATOR MADE OF MAGNETIC MATERIALS FOR TUNING  
MOLECULAR GENERATOR BY ZEEMAN MODULATION  
A66-39851
- GRISHECHKINA, S. P.  
COHERENT RADIATION GENERATION IN ELECTRON-HOLE  
INDIUM ANTIMONIDE PLASMA, DISCUSSING EMISSION  
SPECTRUM A66-40319
- SPONTANEOUS AND INDUCED COHERENT RADIATION FROM  
INDIUM ANTIMONIDE ELECTRON-HOLE PLASMA  
A67-10088
- GROSS, H. E.  
ROOM TEMPERATURE PERFORMANCE OF GA AS LASER  
DIODES, USING S C RS TO ACHIEVE HIGH PULSE  
REPETITION RATE A66-40175
- GROTBECK, R. L.  
RUBY LASER AMPLIFIER DYNAMICS, NOTING AMPLIFICATION  
IN ENERGY GAIN REGIMES AND CORRELATION TO  
THEORETICAL EQUATIONS A66-25049
- DETECTION OF SURFACE SCATTERED LIGHT BY LASER  
RADIATION  
AFWL-TR-65-220 N66-24735
- GRUN, J. B.  
LUMINESCENCE SPECTRUM OF CU CL AT LOW  
TEMPERATURES EXCITED BY DOUBLE PHOTON ABSORPTION  
FROM HIGH INTENSITY LASER BEAM A67-17822

- GRUSAUSKAS, J.  
OPTICAL COMMUNICATION FOR MARS EXPLORATION WITH  
OUTLINE OF LASER MODULATORS AND ANTENNAS A66-25251
- GRZYMA, J. C.  
LASER SYSTEM FOR DIAMOND PIERCING IN WIRE-DRAWING  
DIES AND CLOSED CIRCUIT TV VIEWING SYSTEM FOR  
MONITORING OPERATION A67-15309
- GUBIN, S.  
COMMUNICATION SYSTEMS AT MICROWAVE AND OPTICAL  
FREQUENCIES FOR FUTURE MARS MISSIONS A66-33793
- SPACE COMMUNICATION REQUIREMENTS USING LASERS AND  
MICROWAVES IN MANNED MARS FLIGHTS A66-33794  
AIAA PAPER 65-324
- GUDOVICH, E. S.  
REGENERATIVE HELIUM-NEON LASER WITH AMPLIFICATION  
COEFFICIENT OF 1000 A66-29352
- REGENERATIVE HELIUM-NEON LASER WITH AMPLIFICATION  
COEFFICIENT OF 1000 A66-37357
- GUDZENKO, L. I.  
DEVELOPMENT OF OPTICAL QUANTUM GENERATOR FROM  
HIGHLY IONIZED LOW TEMPERATURE TO CONVERT HEAT  
ENERGY INTO ELECTRIC AND COHERENT LIGHT  
RADIATION ENERGIES FOR USE IN LASER  
JPRS-39659 N67-18113
- GUENTHER, A. H.  
H-2 STOKES RAMAN OSCILLATOR OPERATING AT 9755  
ANGSTROMS, FINDING PERFORMANCE AS EXPECTED OF  
LASER OSCILLATORS WITH BEAM INSTABILITY NOT  
DEVELOPED A67-12516
- PULSE-CURRENT DELAY TIME EFFECT ON LASER TRIGGERED  
HIGH VOLTAGE SPHERE-SPHERE GAP N66-25900  
AFWL-TR-65-32
- RUBY LASER INDUCED BREAKDOWN IN OXYGEN GAS AT HIGH  
PRESSURE N66-35531
- STIMULATED BRILLOUIN EFFECT IN HIGH PRESSURE  
GASEOUS NITROGEN, METHANE, AND CARBON DIOXIDE  
USING GIANT PULSE LASER N66-35533
- GUERS, K.  
C W LASER USING 3-INCH RUBY CRYSTALS WITH 15  
PERCENT MIRROR TRANSMISSION, PUMPING POWER OF  
DOUBLE THRESHOLD VALUE AND 1.6 WATT POWER OUTPUT  
A67-10244
- GUGGENHEIM, H. J.  
FREQUENCY TUNING OF COHERENT EMISSION OVER  
VIBRONIC CONTINUUM OF PHONON-TERMINATED OPTICAL  
MASERS BY THERMAL TUNING AND WAVELENGTH-SELECTIVE  
FEEDBACK A66-41369
- GUILLAUME, C. B. A LA  
OPTICAL EXCITATION IN INDIUM ARSENIDE AND GALLIUM  
ANTIMONIDE YIELDING LASER RADIATION A66-25438
- STIMULATED EMISSION FROM ELECTRON BEAM EXCITATION  
OF TELLURIUM AND PURE AND N-TYPE DOPED INDIUM  
ANTIMONIDE IN SEMICONDUCTOR LASERS A66-26179
- LASER EMISSION IN PURE CADMIUM SULFIDE CRYSTALS  
BOMBARDED BY ELECTRON BEAMS A67-12812
- GUNSTON, W. T.  
LASER APPLICATION SURVEY A66-35798
- GUREVICH, G. L.  
TWO-PHOTON LASER EXCITATION CONDITIONS  
DETERIORATED BY PRESENCE OF RESONATOR TUNED ON  
TRANSITION FREQUENCY BETWEEN OPERATING LEVELS OF  
MATTER A66-37143
- FREQUENCY DOUBLING IN RESONANCE LASER, OBTAINING  
SECOND HARMONIC FIELD FOR LASER RADIATION BY GIANT  
PULSES A66-37144

- GURYANOVA, T. K.  
DISTRIBUTION OF PUMPING RADIATION DENSITY IN  
TRIANGULAR PRISM LASER RESONATOR BY GEOMETRICAL  
OPTICS N66-34774  
TG-230-T476
- GUSINOW, M. A.  
ELECTRON AND NEUTRAL ATOM DENSITIES IN HELIUM AND  
ARGON AFTERGLOW PLASMA OBTAINED BY TWO HELIUM-NEON  
LASER INTERFEROMETERS, NOTING TEMPORAL DEPENDENCE  
OF ELECTRON DECAY A66-41364
- HELIUM-NEON LASER INTERFEROMETERS TO OBTAIN  
ELECTRON AND NEUTRAL ATOM DENSITIES IN HELIUM  
AND ARGON AFTERGLOW PLASMAS N66-25866  
ARCO-4832-7
- GUSTAFSON, H.  
MODE COUPLING EFFECTS DUE TO SCATTERING IN  
TRAVELING WAVE HELIUM-NEON RING LASER N67-19096  
NASA-CR-82490
- GYORFFY, B. L.  
PRESSURE EFFECTS IN FABRY-PEROT LOSSY-CAVITY GAS  
LASER OUTPUT A66-26199

## H

- HABEGGER, M. A.  
DYNAMIC LASER WAVELENGTH SELECTION BY INSERTION OF  
DISPERSIVE TUNABLE ELECTRO-OPTIC Q-SPOILER WITHIN  
LASER CAVITY A66-40866
- HADDAD, G. I.  
DIELECTRIC MATERIAL POSITION EFFECT ON  
CHARACTERISTICS OF LADDER LINE SLOW WAVE STRUCTURE  
OF TW MASERS A66-27960
- ANNUAL ELECTRON AND LASER BEAM SYMPOSIUM,  
UNIVERSITY OF MICHIGAN, ANN ARBOR, APRIL 1966  
A67-15300
- HAGEN, A. A.  
OPTICAL INSTRUMENTATION RADAR FOR REAL-TIME  
POSITIONAL DATA ON HIGH-SPEED COOPERATIVE TARGETS  
A66-25654
- HAGLER, M. O.  
HIGH-TEMPERATURE RESEARCH WITH INFRARED MASER FOR  
TIME-SPACE RESOLVED DIAGNOSTICS OF DEUTERIUM  
PLASMAS N66-30302  
ARL-65-270
- HAKEN, H.  
PHASE AND AMPLITUDE FLUCTUATION OF GAS AND SOLID  
STATE LASERS, ACCOUNTING FOR NOISE CAUSED BY  
PUMPING, INCOHERENT DECAY, LATTICE VIBRATIONS AND  
ATOMIC COLLISIONS A67-14949
- HALDEMANN, P.  
ALUMINUM COLD CATHODES FOR SINGLE MODE HELIUM  
NEON GAS LASERS N67-16017
- HALL, J. L.  
PHOTODETACHMENT PROBABILITY FOR CS AND NEGATIVE  
I DUE TO SIMULTANEOUS ABSORPTION OF TWO RUBY  
QUANTA A67-16627
- HALLOCK, H. B.  
OPTICAL COMMUNICATION FOR MARS EXPLORATION WITH  
OUTLINE OF LASER MODULATORS AND ANTENNAS A66-25251
- HALSEY, H. W.  
RUBY LASER ENERGY REFLECTED OFF EXPLORER XXII  
SATELLITE A66-27054
- HAMASAKI, J.  
CURRENT MEASURING DEVICE FOR EHV TRANSMISSION  
LINE, OBTAINING INSTANTANEOUS MAGNETIC FIELD BY  
GAUGING FARADAY ROTATION ANGLE OF LASER BEAM IN  
FLINT GLASS ROD A66-42556
- HAMMER, H.  
SPATIAL COHERENCE MEASUREMENT OF HE-NE LASER  
OUTPUT A66-35592
- HAMMER, J. M.  
ELECTRO-OPTIC INTRA-CAVITY COLOR SWITCHING IN



- KRYPTON ION FABRY- PEROT LASER  
A67-17888
- HANKIN, R. B.  
OPTICAL SURFACE ROUGHNESS MEASUREMENT USING  
COHERENT RADIATION PRODUCED BY HELIUM-NEON LASER  
SIGMA-POLARIZED AT 6328 ANGSTROMS  
A67-10020
- HANNA, D. C.  
LOSS MEASUREMENT FOR RUBY LASER RESONANT CAVITY,  
COMPARING THRESHOLDS FOR R SUB 1 AND R SUB 2  
LINE OPERATION  
A67-16655
- HANNAN, W. J.  
VOICE COMMUNICATIONS SYSTEM USING GA AS ROOM-  
TEMPERATURE INJECTION LASER AND TV COMMUNICATIONS  
SYSTEM USING GA AS CRYSTALS AS MODULATORS FOR  
LASER BEAMS  
A67-11786
- GA AS ROOM TEMPERATURE LASER DIODE APPLICATION TO  
COMMUNICATION AND RADAR SYSTEMS  
A67-19086
- HANSEN, W. P.  
OPTICAL RAY TRACING TO PREDICT FOCUSING  
CHARACTERISTICS OF LASER LIGHT IN REFRACTIVE  
TARGETS, CALCULATING HEATING EFFECTS IN TARGET,  
NOTING TARGET GEOMETRY, REFRACTIVE INDEX,  
THICKNESS OF SKIN LAYERS, ETC  
A66-25531
- HANUS, J.  
SECOND HARMONIC GENERATED BY TRANSMITTING LASER  
RADIATION THROUGH TELLURIUM MONOCRYSTAL, WHILE  
FILTERING OUT FUNDAMENTAL FREQUENCY  
A66-25437
- INTENSE PULSE GENERATION AT 5300 ANGSTROMS BY  
FREQUENCY DOUBLING IN Q-SWITCHED AND GLASS LASER  
AND POSSIBILITY OF GENERATING PARTICULAR HARMONICS  
A67-10759
- HAPPER, W., JR.  
LIGHT SHIFT, LIGHT MODULATION AND PHASE PULLING IN  
OPTICALLY PUMPED RUBIDIUM MASER  
A66-26202
- HARADA, R. H.  
HIGH POWER CARBON DIOXIDE LASER HETERODYNE  
DETECTION OF BEATS AND LINEWIDTH MEASUREMENTS  
A67-17891
- HARASHIMA, O.  
RECENT DEVELOPMENTS IN LASER GENERATION AND  
APPLICATION  
A66-28037
- HARD, T. M.  
C W HE- NE LASER COMPARED WITH MERCURY ARC  
SOURCE, OBTAINING RAMAN SPECTRA OF CARBON  
TETRACHLORIDE BY THREE METHODS OF EXCITATION  
A67-13912
- HARDAWAY, G. A.  
CAUSES OF FAILURE AND GUIDELINES FOR DESIGN OF  
SOLID STATE LASERS  
A66-27669
- HARDWAY, G. A.  
NARROW BEAM DIVERGENT Q-SWITCHED LASER PULSE  
GENERATION, NOTING OUTPUT CHARACTERISTICS AND  
APPLICATIONS  
A67-11024
- HARGROVE, L. E.  
OPTICAL FREQUENCY TRANSLATION OF PULSES FROM MODE  
LOCKED LASER, NOTING DOPPLER SHIFTS OF LARGE  
MAGNITUDE  
A67-12506
- HARKER, R. I.  
LIGHT SCATTERING TECHNIQUES FOR CRYSTAL EVALUATION  
AFCL-66-119  
N66-26436
- HARRINGTON, F. D.  
TIME RESOLVED SPECTROSCOPY OF FLASHLAMP PULSES  
N67-12652
- HARRIS, F. S., JR.  
PHOTOGRAPHIC COPIES OF HOLOGRAMS TAKEN WITH LASER  
LIGHT NOTING FILM, LIGHT SOURCE, DIRECTIONAL  
EFFECT, PROCESSING, ETC  
A66-26000
- HARRIS, S. E.  
LASER MODE CONTROL AND STABILIZATION USING  
INTERNAL TIME-VARYING PERTURBATION  
A66-42813
- THRESHOLD OF PARAMETRIC OSCILLATOR SYSTEM WITH  
IDLER MODES IN SAME FREQUENCY SPACING AS LASER  
PUMP SOURCE  
A67-16823
- ARGON FM LASER, PARAMETRIC OSCILLATOR, AND  
BACKWARD WAVE OSCILLATOR DEVELOPMENT  
NASA-CR-81730  
N67-18019
- HARRIS, T. J.  
DYNAMIC LASER WAVELENGTH SELECTION BY INSERTION OF  
DISPERSIVE TUNABLE ELECTRO-OPTIC Q-SPOILER WITHIN  
LASER CAVITY  
A66-40866
- HARTMANN, B.  
IDENTIFICATION OF NUMBER OF LINES AT 11 MICRONS  
EMITTED FROM PULSED CARBON DIOXIDE LASER AS P  
BRANCH OF CARBON DIOXIDE VIBRATIONAL TRANSITION  
A66-37629
- HARTMANN, S. R.  
PHOTON ECHO, OPTICAL ANALOG OF SPIN ECHO, IN RUBY  
CRYSTALS, USING RUBY LASER AS EXCITATION SOURCE  
A66-26170
- HASWELL, W. T., III  
HIGH POWER CARBON DIOXIDE LASER HETERODYNE  
DETECTION OF BEATS AND LINEWIDTH MEASUREMENTS  
A67-17891
- HATHAWAY, R. N.  
PROGRAM PLANNING, GROUND SUPPORT AND AIRBORNE  
EQUIPMENT FOR LASER SPACE COMMUNICATION SYSTEM  
NASA-CR-78855  
N66-39446
- PROGRAM SPECIFICATIONS FOR LASER SPACE  
COMMUNICATION STUDY  
NASA-CR-78856  
N66-39447
- HATZ, E. M.  
POLARIZATION OF PULSED RADIATION FROM GA AS LASER  
DIODE TO DETERMINE ORIGIN OF NATURAL OSCILLATIONS  
OF RESONATOR  
A66-37549
- HAUCHECORNE, G.  
LOCALIZED DEEP BRAIN TISSUE LESIONS IN CATS BY  
LASER ENERGY  
A66-81895
- HAUG, H.  
INTENSITY AND FREQUENCY EQUATIONS FOR INTERBAND  
OPTICAL TRANSITIONS AND MULTIMODE PROPERTIES IN  
SEMICONDUCTOR LASERS  
A66-39666
- ELECTRON THERMALIZATION EFFECT ON SEMICONDUCTOR  
LASER BEHAVIOR, NOTING OPTICAL TRANSITION BETWEEN  
IMPURITY LEVEL AND BAND, TAKING INTO ACCOUNT  
DIFFUSION PROCESS  
A66-40790
- HAUGHT, A. F.  
ELECTRICAL BREAKDOWN OF GASES BY OPTICAL FREQUENCY  
RADIATION, NOTING LASER BEAM ATTENUATION AND  
SUBSEQUENT ENERGY ABSORPTION BY PLASMA  
A66-26190
- OPTICAL FREQUENCY BREAKDOWN THRESHOLD OF INERT GAS  
MIXTURES, USING FOCUSED BEAM RADIATION FROM Q-  
SPOILED NEODYMIUM LASER  
A66-34236
- HIGH TEMPERATURE HIGH-DENSITY PLASMA FROM SINGLE  
SOLID PARTICLE OF LITHIUM HYDRIDE SUSPENDED IN  
VACUUM, USING RUBY LASER IRRADIATION  
A66-36596
- HIGH TEMPERATURE SINGLE SOLID PARTICLE PLASMA  
GENERATION BY FOCUSED GIANT PULSE Q-SPOILED RUBY  
LASER BEAM IRRADIATION OF LI H SUSPENDED IN  
VACUUM ELECTRIC FIELDS  
A67-14047
- HAUN, R. D., JR.  
LASER AND MASER DEVELOPMENT, DISCUSSING DESIGN  
IMPROVEMENTS AND APPLICATION FOR TELEVISION,  
SPACE COMMUNICATIONS, ETC  
A66-32353
- HAUS, H. A.  
PHOTOELECTRON COUNTS OF PHOTOMULTIPLIER

- ILLUMINATED BY GAS LASER LIGHT SOURCE A66-26211
- NEAR- BOSE- EINSTEIN PROBABILITY DISTRIBUTION OF PHOTOELECTRON COUNTS PRODUCED BY HE- NE GAS LASER NARROW BAND GAUSSIAN LIGHT SOURCE OPERATING SLIGHTLY BELOW OSCILLATION THRESHOLD A66-30645
- PHOTOELECTRON EMISSION STATISTICS DETERMINING PROBABILITY DISTRIBUTION OF PHOTOELECTRON COUNTS IN PHOTOMULTIPLIER ILLUMINATED BY LASER BELOW AND ABOVE THRESHOLD OF OSCILLATION A66-42543
- HAYAMI, H.  
LOW THRESHOLD NEODYMIUM GLASS LASER OSCILLATOR WITH HIGH REPETITION A66-33325
- HAYASHI, R.  
PARAMAGNETIC RESONANCE SPECTRA SHIFT DUE TO TEMPERATURE CHANGE IN CROSS-RELAXATION RUTILE MASER A66-30820
- TEMPERATURE DEPENDENCE OF PARAMAGNETIC RESONANCE SPECTRAL SHIFTS IN CHROMIUM-DOPED TITANIUM OXIDE CRYSTAL OF CROSS RELAXATION RUTILE MASER A67-19676
- HAYES, J. L.  
AMPLITUDE AND FREQUENCY MEASUREMENT OF RANDOM POSITION FLUCTUATION OF STATIONARY LASER OPTICAL SOURCE DUE TO ATMOSPHERIC TURBULENCE NASA-TN-D-3439 N66-25558
- HAYWARD, J. S.  
NATURE OF EXCITED STATE RESULTING FROM TWO-QUANTUM ABSORPTION ASSOCIATED WITH FLUORESCENCE IN ANTHRACENE PRODUCED BY RUBY LASER A67-16130
- HEARNE, K. R.  
AMPLITUDE OF LF OSCILLATIONS IN HE- NE LASER A67-16948
- HECHT, G. J.  
HIGH SPEED STROBOSCOPIC PHOTOGRAPHY USING KERR CELL MODULATED LASER SOURCE A66-30828
- HECKEN, R.  
SUPPRESSION OF UNDESIRABLE AXIAL MODES IN GAS LASER OSCILLATING AT SEVERAL FREQUENCIES OBTAINED BY FILLING WITH ACTIVE GAS MIXTURE EACH OF TWO COUPLED FABRY- PEROT TYPE RESONATORS A67-17326
- HEER, C. V.  
RESONANT FREQUENCY EQUATIONS FOR OPTICAL MASER PHOTON RATE GYROSCOPE DESIGN NASA-CR-59820 N66-33372
- MATHEMATICAL DEVELOPMENT OF RESONANT FREQUENCIES OF ELECTROMAGNETIC CAVITY - EVALUATION OF OPTICAL MASER PHOTON RATE GYROSCOPE NASA-CR-59809 N66-33411
- HEFLINGER, L. O.  
PULSED LASER HOLOGRAPH AND PROBLEM OF OVERCOMING LIMITED COHERENCE A66-42560
- HEMTA, C. L.  
OPTICAL COHERENCE FUNCTIONS AND PROPERTIES FROM STATISTICAL VIEWPOINT FOR APPLICATION TO SPECTROSCOPY AND STELLAR INTERFEROMETRY A66-31987
- HEILOS, L. J.  
HYSTERESIS PHENOMENA IN HE- NE GAS LASER IN AXIAL MAGNETIC FIELD AND POLARIZATION OF OSCILLATING MODE WITHIN CERTAIN TUNING REGION A66-29385
- HEISE, B. H.  
PRODUCTION ENGINEERING MEASURE TO IMPROVE CRYSTAL QUALITY AND PRODUCTION YIELD OF RUBY LASER CRYSTAL GROWTH QPR-2 N66-30291
- HELLER, A.  
TRIVALENT NEODYMIUM IN SELENIUM OXYCHLORIDE, INORGANIC LIQUID LASER WITHOUT LIMITATIONS OF EUROPIUM CHELATES AND MATCHING IN THRESHOLD AND OUTPUT NEODYMIUM-DOPED CRYSTALS A66-39110
- PERFORMANCE CHARACTERISTICS OF ROOM TEMPERATURE LIQUID LASER, USING TRIVALENT ION NEODYMIUM-DOPED SELENIUM OXYCHLORIDE A66-39111
- HELLERSTEIN, D.  
SENARMONT POLARISCOPE APPLIED TO ANALYSIS OF OPTICAL MASER LIGHT N67-17278
- HELLWARTH, R. W.  
EFFECT OF FLUCTUATING LASER PUMP ON STIMULATED RAMAN SCATTERING, NOTING GROWTH OF COUPLED STOKES-ANTI- STOKES WAVES IN PRESENCE OF TWO-MODE PUMP A66-26158
- Q MODULATION OF LASER THEORY AND APPLICATION, PRESENTING GIANT PULSE PRODUCTION, PHENOMENOLOGICAL THEORY, OUTPUT RESPONSE TO STEP FUNCTION CHANGE, ELECTRO-OPTIC AND MECHANICAL MODULATORS A66-36971
- HIGH ENERGY DIFFRACTION LIMITED RAMAN LASER REALIZATION STUDIES AD-636250 N66-37176
- HELLWIG, H.  
FREQUENCY STABILITY OF DOUBLE BEAM AMMONIA LASER WITH THERMOSTATIC QUARTZ RESONATORS ON 3-2 LINE A67-10247
- HENAFF, J.  
LASER LIGHT MODULATION BY POCKELS OR KERR EFFECT FOR APPLICATION TO TELECOMMUNICATIONS SYSTEM, EXAMINING ELECTRICAL BIREFRINGENCE MODULATION A66-36262
- HENDERSON, J. R.  
CHEMICAL PUMPED UV LASER ACTION THROUGH THERMAL DECOMPOSITION OF DIMETHYL PEROXIDE A66-28836
- HENKEL, H.-J.  
GALLIUM ARSENIDE LASER DIODE CHARACTERISTICS A66-25112
- HENNEBERGER, W. C.  
MODE LOCKING IN GASEOUS LASER WHOSE CAVITY IS LENGTH MODULATED AT MODE SEPARATION FREQUENCY A66-31095
- HENRY, C. H.  
SUM AND DIFFERENCE FREQUENCY MIXING OF VISIBLE AND IR GAS LASER LIGHT IN GA P AT NEAR RESTSTRAHL FREQUENCIES AND RELATIONSHIP TO SPONTANEOUS RAMAN SCATTERING A67-15464
- HENRY, H. E.  
PROGRAM PLANNING, GROUND SUPPORT AND AIRBORNE EQUIPMENT FOR LASER SPACE COMMUNICATION SYSTEM NASA-CR-78855 N66-39446
- PROGRAM SPECIFICATIONS FOR LASER SPACE COMMUNICATION STUDY NASA-CR-78856 N66-39447
- HENRY, L.  
PHYSICAL MECHANISM OF MOLECULAR LASERS AND VIBRATIONAL ROTATION RELATION A66-33246
- HENTLEY, E. L.  
TRAVELING WAVE MASER FOR RADIO ASTRONOMY INTERFEROMETER NOTING SUPERCONDUCTING MAGNET, DYNAMO AND CRYOSTAT A67-20115
- HERGENROTHER, K. M.  
IMPURITY CONCENTRATION EFFECT ON MAXIMUM CONTINUOUS WAVE POWER FROM GALLIUM ARSENIDE LASERS AT 77 DEGREES K A66-37782
- FAR-FIELD LIGHT EMISSION MODE PATTERN OF GA AS DIODE INJECTION LASERS, DIELECTRIC GRADIENT IN INVERSION LAYER AND REFRACTIVE INDEX IN JUNCTION A66-39743
- CONDUCTIVITY MODULATION BY HEAVY-TO-LIGHT HOLE

- TRANSITIONS IN P-TYPE GERMANIUM NOTING CARRIER  
LIFETIME AND RINGING OF LASER PULSE A66-42249
- HERNQVIST, K. G.  
CHARGED PARTICLES FOR LASING, DISCUSSING  
MANUFACTURE OF ARGON LASER A67-19083
- HERRERA-CANTILLO, L. M.  
LASER SYSTEM FOR DETERMINING SKY BACKSCATTERING  
RADIATION - SUBSYSTEM CIRCUIT DIAGRAMS N67-13120  
NASA-CR-80441
- HERRICK, R. B.  
FLUCTUATIONS IN MEAN REFRACTIVE INDEX OVER LONG  
PATH THROUGH TURBULENT ATMOSPHERE EXAMINED, USING  
MICHELSON INTERFEROMETER WITH HE-NE LASER A66-32618  
SOURCE
- HERTZBERG, A.  
THERMALIZATION OF PLASMA BY CREATING IMPLODING  
SHOCK WAVE DRIVEN BY LASER ENERGY RELEASE A66-26683
- HERZIGER, G.  
ELECTRON DENSITIES IN HELIUM PLASMA MEASURED BY  
LASER AMPLIFIER WITH MAXIMUM GAIN AND MINIMUM  
BANDWIDTH AT POINT NEAREST THRESHOLD A67-16663
- HESS, L. D.  
SATURABLE DYES NOTING MODE SELECTION PROPERTIES  
AND ABSORPTION SPECTRA IN BLEACHED STATE A66-42253
- HESSEL, K. R.  
GIANT PULSE LASER WITH HIGH REPETITION RATE FOR  
OPTICAL RANGING SYSTEMS N66-36248  
NSF-P-9
- HETHERINGTON, A.  
SPONTANEOUS EMISSION AND TRANSVERSE GAIN  
MEASUREMENTS IN GA AS INJECTION LASER AT 80  
DEGREES K AND FOR 8466 ANGSTROM WAVELENGTH A66-28627
- TRANSVERSE GAIN AND SPONTANEOUS AND STIMULATED  
EMISSION AT 8466 ANGSTROMS IN GA AS STRUCTURES A66-42561
- HEYNAU, H.  
REVERSIBLE BLEACHABLE DYE-SOLUTIONS FOR EXPANDER  
ELEMENTS IN LASER A66-29388
- HEYNAU, H. A.  
SINGLE SELF-MODE-LOCKED PULSE SELECTION FROM  
BLEACHABLE DYE Q-SWITCHED ND-DOPED GLASS LASER A67-10875
- HIGA, W. H.  
MICROWAVE MIXING IN PARAMAGNETIC CRYSTAL USING  
TRAVELING WAVE MASER WITH RUBY AS MIXER ELEMENT,  
NOTING FREQUENCY CONVERSION A67-10003
- DUAL CHANNEL TRAVELING WAVE HYDROGEN MASER FOR  
FREQUENCY GENERATION AND CONTROL N66-38555
- DUAL CHANNEL TRAVELING WAVE MASER FOR INTEGRATION  
IN CLOSED CYCLE REFRIGERATOR N67-15908
- HILBERG, R. P.  
NEODYMIUM LASER OSCILLATOR USING TIME-VARIABLE  
REFLECTOR, NOTING LOADING AND DUMPING OF OPTICAL  
CAVITY WITH NEARLY MAXIMUM AMOUNT OF ENERGY A66-39118
- OPERATION OF SYNCHRONIZED NEODYMIUM LASER TIME  
VARIABLE REFLECTION / TVR/ OSCILLATOR, USING  
SINGLE POCKELS CELL TO OBTAIN Q-SWITCHING AND  
CAVITY DUMPING A67-17525
- HILGERTNER, L.  
NEODYMIUM DOPED OPTICAL GLASSES FOR LASER  
TECHNOLOGY A67-16855
- HILL, T. W.  
Q-SWITCHED RUBY LASER USED TO EXPLODE PSEUDO-AIR  
TARGETS
- NOLTR-65-152 N66-29965
- HIOKI, R.  
OPTICAL RESONATOR DIFFRACTION LOSS, NOTING LASER  
OSCILLATIONS IN HIGH LOSS ARRANGEMENTS, OUTPUT  
BEAM POWER, FIELD PATTERNS, ETC A66-25195
- SPATIAL COHERENCE OF LASER LIGHT BEAM AFTER  
EXTREME WAVEFRONT DISTORTIONS ON DIFFUSION  
EXPLAINED ON BASIS OF FRAUNHOFER AND FRESNEL  
DIFFRACTION A67-11062
- FOURIER TRANSFORM HOLOGRAPHY FOR DIFFUSION OF  
COHERENT LASER LIGHT BEAM, EXAMINING DISTORTION  
TERM IN RECONSTRUCTED IMAGE A67-11063
- HIRSCHMANN, E.  
ELECTRO-OPTIC LIGHT MODULATORS OF LASER BEAMS  
NASA-TN-D-3678 N67-10788
- HO, C.-T.  
LASER SATURATION OF PHOTOCONDUCTIVITY AND  
DETERMINATION OF IMPERFECTION PARAMETERS IN  
SENSITIVE PHOTOCONDUCTORS SUCH AS SINGLE CRYSTAL  
OF CADMIUM A67-11879
- HOBART, J. L.  
RETARDATION-TYPE LASER MODULATORS, EXAMINING  
DRIVING POWER, TRANSMISSION AND DYNAMIC RANGE A66-32820
- LOW POWER WIDE BANDWIDTH LASER MODULATORS  
N67-13069
- HOCHULI, U.  
ALUMINUM COLD CATHODES FOR SINGLE MODE HELIUM  
NEON GAS LASERS N67-16017
- HOCKER, L. O.  
MOLECULAR GAS LASER Q-SWITCHING TECHNIQUES,  
DETERMINING ROTATIONAL COLLISION SECTIONS FOR  
CARBON DIOXIDE AND CROSS SECTIONS FOR VIBRATIONAL  
RELAXATION A67-16632
- HODARA, H.  
ATMOSPHERIC TURBULENCE EFFECTS ON LASER BEAM  
PROPAGATION, NOTING BEAM CROSS SECTION, PHASE  
VARIATION, AM AND FM, ETC A66-27035
- EXCESS PHOTON NOISE IN DETECTED PHOTOCURRENT OF  
MULTIMODE LASER FOR UNCOUPLED AND PHASE LOCKED  
MODES A67-16623
- HODGES, E. B.  
PULSED TOROIDAL EXCITATION OF GAS ION LASERS  
EXTENDED TO DRIVE HIGH POWER CW LASER TRANSITIONS  
IN AR, KR, CL AND BR, NOTING OPERATING  
PARAMETERS AND POWER OUTPUT A66-28877
- HOEHM, D. H.  
ATMOSPHERIC TURBULENCE EFFECT ON LASER BEAM  
INTENSITY DISTRIBUTION A66-41030
- ATMOSPHERIC TURBULENCE EFFECT ON FREQUENCY SPECTRA  
OF LIGHT INTENSITY FLUCTUATIONS EXAMINED, USING  
HE-NE LASER A66-41031
- HOEHNE, W. E.  
LASER SYSTEM FOR METEOROLOGICAL DATA USING  
OSCILLOSCOPE TO DISPLAY RETURN SIGNAL, TRANSLATED  
AS CONCENTRATIONS OF MATTER OR AEROSOLS A66-43044
- SMALL LASER RADAR APPLIED TO METEOROLOGICAL  
STUDIES PMR-TM-66-6 N67-12294
- HOFF, F.  
STATISTICAL DISTRIBUTION OF AM LASER SIGNAL  
ENVELOPE UPON PASSAGE THROUGH TURBULENT ATMOSPHERE  
A67-13988
- HOLLAND, T. E.  
OPTICAL BEAM DEFLECTION TECHNIQUE USING  
INTERFEROMETER CAVITY ILLUMINATED BY GAS LASER  
BEAM A66-28689

## HOLLOWAY, W. W., JR.

TEMPERATURE DEPENDENCE OF THRESHOLD FOR STIMULATED EMISSION OF Nd TRIVALENT ION IN SEVERAL HOST LATTICES ESTIMATED FROM INTENSITY VARIATION OF LASER ACTIVE FLUORESCENCE COMPONENT

A67-11085

## HOLONYAK, N., JR.

CRYSTAL GROWTH, DIFFUSION AND FABRICATION OF GALLIUM ARSENIDE-PHOSPHIDE JUNCTION LASERS WITH LOW THRESHOLD CURRENT DENSITIES

A66-37401

OPTICAL PUMPING WITH DIODE LASER INTO FABRY-PEROT RESONATOR FACE OF THIN HIGHLY-ABSORBING SEMICONDUCTOR, NOTING VARIABLE MODE SPACING INCLUDING SINGLE MODE OUTPUT

A67-10879

SYNTHESIS, JUNCTION FABRICATION, AND LUMINESCENT OPERATION OF GALLIUM-ARSENIDE-PHOSPHIDE SEMICONDUCTORS

AFCRL-66-245

N66-36868

JUNCTION EFFECTS IN COMPOUND SEMICONDUCTORS

AFCRL-66-617

N67-15074

## HOLSTEIN, T. D.

ATMOSPHERIC HEATING BY LASER PULSES IN TRANSMISSION WINDOWS

TRW-4535-6003-RO-000

N66-34232

## HONEY, R. C.

HIGH POWERED Q-SWITCHED RUBY LASER / LIDAR / FOR METEOROLOGICAL APPLICATION, NOTING SYSTEM EQUATIONS, DESIGN, OPERATION, ETC

A66-26548

## HOOK, W. R.

NEODYMIUM LASER OSCILLATOR USING TIME-VARIABLE REFLECTOR, NOTING LOADING AND DUMPING OF OPTICAL CAVITY WITH NEARLY MAXIMUM AMOUNT OF ENERGY

A66-39118

OPERATION OF SYNCHRONIZED NEODYMIUM LASER TIME VARIABLE REFLECTION / TVR / OSCILLATOR, USING SINGLE POCHELLS CELL TO OBTAIN Q-SWITCHING AND CAVITY DUMPING

A67-17525

## HOOPER, E. B., JR.

THREE-MIRROR LASER INTERFEROMETER MEASURING ELECTRON DENSITIES IN REPETITIVELY PULSED PLASMAS

A67-11875

## HOPKINS, B. D.

PULSED LASER ACTION IN VISIBLE SPECTRUM OF SINGLY IONIZED GE, SN, PB, IN, CD AND ZN, LISTING TEMPERATURE AND PRESSURE RANGES

A66-36076

## HOPSON, J. E.

OPTO-ELECTRONIC AIRCRAFT ALTIMETER CONCEPT BASED ON PROPERTIES OF ELECTRON INJECTION LASERS AND SILICON PHOTODIODES

N67-13079

## HORNBY, P.

CEREBRAL CORTEX OF DOG AS AFFECTED BY LASER RADIATION

A66-82035

## HORNIG, A. W.

LASER OPERATION ON CIRCULARLY POLARIZED MODE

AFOSR-66-2679

N67-17274

## HARRIGAN, F.

OPTIMIZATION OF HIGH-POWER CONTINUOUS-WAVE GAS LASER HAVING CARBON DIOXIDE, NITROGEN, AND HELIUM MIXTURE AS ACTIVE MEDIUM

S-865

N66-38449

## HARRIGAN, F. A.

TRANSITION PROBABILITIES AND LIFETIMES IN IONIZED ARGON GAS LASERS

A66-26207

## HOSKINS, R. H.

C W LASER ACTION IN HOLMIUM-DOPED ERBIUM TRIOXIDE WITH DOMINANT PUMPING BY ENERGY TRANSFER BETWEEN IONS

A66-42555

FEASIBILITY OF USING FLUORESCING DYES PUMPED WITH RUBY LASER FOR LOWER THRESHOLDS THAN RAMAN TYPE

## LASERS

AD-636953

N66-38187

## HUGGINS, C. T.

COMMUNICATION SYSTEM RESEARCH ON HYDROGEN MASER, SOLID STATE IMAGE CONVERTER, AND TELEMETRY SIGNAL PROPAGATION

NASA-TM-X-53535

N67-16724

## HUGHES, K. A.

SCANNING ELECTRON MICROSCOPE TO EXAMINE CRYSTAL MOSAIC STRUCTURES AND LASING PROPERTIES OF GALLIUM ARSENIDE LASER DIODES

A66-33300

## HUGHES, W. E.

ZERO MAGNETIC FIELD MILLIMETER MASER USING TRIVALENT IRON ION IN HOST CRYSTALLINE STRUCTURE OF RUTILE /TITANIUM DIOXIDE/ AS ACTIVE MATERIAL

A66-29018

SOLID STATE MASER OSCILLATOR OPERATING IN ZERO FIELD CONFIGURATION, USING FERRIC ION SUBSTITUTED AS IMPURITY IN ALUMINUM NITRATE HOST CRYSTAL

A66-42551

## HULL, D.

Q-SWITCHED RUBY LASER OUTPUT INCREASED BY USE OF SATURABLE DYE SOLUTION IN LASER CAVITY

A66-37290

## HURT, C. R.

FLUORESCENCE QUANTUM EFFICIENCIES OF OCTA-COORDINATED EUROPIUM HOMOGENEOUS AND MIXED CHELATES IN ORGANIC SOLVENTS, NOTING EFFECT OF OXYGEN REMOVAL

A66-41153

## HURWITZ, C. E.

LASER OSCILLATIONS IN CdSe AND CdS BOMBARDED BY FAST ELECTRON BEAM

A66-27031

SEMICONDUCTOR LASERS WITH HIGH POWER EFFICIENCY OBTAINED VIA ELECTRON BEAM EXCITATION ON CRYSTALS OF MIXED CADMIUM-SULFIDE-SELENIDE ALLOY

A66-31533

CHARACTERISTICS OF EFFICIENT SEMICONDUCTOR LASERS IN UV PORTION OF SPECTRUM OBTAINED AT BOTH LIQUID HELIUM AND NITROGEN TEMPERATURES, USING PULSED ELECTRON BEAM EXCITATION ON ZnS CRYSTALS

A66-39114

## HUSSAIN, Y. U.

AVAILANCHE TRANSISTOR GENERATION OF JITTER-FREE NANOSECOND CURRENT PULSES FOR DRIVING GaAs LASER DIODES AT LOW TEMPERATURES

A66-37453

## HUTCHESON, R. L.

PRODUCTION ENGINEERING MEASURE FOR RUBY LASER RODS

QPR-3

N67-15107

## HUTCHINGS, T. J.

AMPLITUDE AND FREQUENCY CHARACTERISTICS OF TRAVELING WAVE RING LASER

A67-15777

## HUTCHISON, T. C.

OPTICAL INSTRUMENTATION RADAR FOR REAL-TIME POSITIONAL DATA ON HIGH-SPEED COOPERATIVE TARGETS

A66-25654

## HUTH, B. G.

STIMULATED RAMAN EFFECT AND TUNABILITY OF RAMAN LASER

A66-25062

COUPLING OF ADJACENT AXIAL MODES IN EXTERNAL RAMAN RESONATOR OBSERVED AS FIRST STOKES FREQUENCY WITH BENZENE AS RAMAN MEDIUM AND Q-SWITCHED RUBY LASER AS PUMP SOURCE

A66-39109

## HYMAN, H.

ABSOLUTE DIRECT EXCITATION CROSS SECTION FROM NEUTRAL GROUND STATE FOR UPPER LEVELS OF TRANSITION IN ARGON LASER

A67-12520

## IAKOBSON, S. V.

INDIUM PHOSPHIDE BASED SEMICONDUCTOR LASER

- AMPLIFICATION, LOSS FACTOR AND RADIATION PATTERN  
A67-10065
- IAKOVLEV, V. A.  
CURRENT INJECTION EFFECT ON TIME DELAY OF GA AS  
LASER RADIATION A67-10083
- IAKUBOVICH, E. I.  
LASER OSCILLATION AND ENERGY LOSSES IN MEDIUM  
CONTAINING ACTIVE MOLECULES A66-26043
- PERIODIC AUTOMODULATION OF RADIATION AND  
POSSIBILITY OF GENERATING GIANT PULSES IN THREE-  
LEVEL LASER WITH INHOMOGENEOUSLY EXCITED ACTIVE  
MEDIUM A67-17233
- IARENKO, A. M.  
RUBY LASER PUMPING THRESHOLD ENERGY, DIVERGENCE  
ANGLE AND OUTPUT POWER AS AFFECTED BY RESONATOR  
LENGTH A66-39769
- RUBY LASER PUMPING THRESHOLD ENERGY, DIVERGENCE  
ANGLE AND OUTPUT POWER AS AFFECTED BY RESONATOR  
LENGTH A67-12855
- POSSIBLE OSCILLATION MODES IN CYLINDRICAL SOLID  
STATE LASER AND DEPENDENCE OF PUMPING THRESHOLD,  
OUTPUT POWER AND DIVERGENCE ANGLE ON RESONATOR  
LENGTH A67-13129
- IAROSHETSKII, I. D.  
DISINTEGRATION OF ALKALI HALIDE SINGLE CRYSTALS,  
POLYMERS AND GLASSES UNDER LASER RADIATION, NOTING  
PARAMETERS OF DISINTEGRATION REGION MAGNITUDE  
A66-34681
- LASER BEAM EFFECT ON HYDRODYNAMIC BEARINGS,  
DISCUSSING MICROCRACKS AND CRITICAL ENERGY,  
EXPLAINING BREAKDOWNS A66-41409
- LI F SINGLE CRYSTAL DESTRUCTION AS FUNCTION OF  
LASER BEAM ENERGY, EXAMINING DISLOCATION PATTERN  
ARISING FROM CRACK PROPAGATION A67-10071
- POLYMETHYLMETHACRYLATE AND POLYSTYRENE EXPOSURE  
TO RUBY AND NEODYMIUM-GLASS LASER RADIATION,  
NOTING APPEARANCE OF EPR A67-10075
- DISINTEGRATION OF ALKALI HALIDE SINGLE CRYSTALS,  
POLYMERS AND GLASSES UNDER LASER RADIATION, NOTING  
PARAMETERS OF DISINTEGRATION REGION MAGNITUDE  
A67-14367
- KINETICS OF FORMATION AND HEALING OF DAMAGE CAUSED  
BY LASER PULSE IN LITHIUM FLUORIDE SINGLE CRYSTALS  
A67-17057
- IATSENKO, A. F.  
CONTINUOUS HELIUM-NEON LASER USED TO OBTAIN  
SHORT INTENSE LIGHT PULSES AND TO STUDY KINETICS  
OF AUTOPHOTOELECTRONIC EMISSION OF HIGH  
RESISTIVITY SILICON A67-13142
- IIDA, S.  
PHOTOCONDUCTIVE AND LUMINESCENT BEHAVIOR OF  
UNDOPED CADMIUM SULFIDE SINGLE CRYSTALS AT ROOM  
TEMPERATURE UNDER LASER EXCITATION A66-39165
- IKEGAMI, T.  
RESONANCE-LIKE CHARACTERISTICS OF DIRECT  
MODULATION OF JUNCTION LASER WITH BIAS CURRENT  
ANALYZED BY RATE EQUATIONS A67-19800
- ILIFF, R. L.  
RUBY LASER TO ILLUMINATE EXPLORER XXII SATELLITE  
WITH ENOUGH INTENSITY TO PHOTOGRAPH CUBE CORNER  
REFLECTORS LOCATED ON SATELLITE  
AFCL-65-442 N66-31142
- ILINOVA, T. M.  
SELF-EXCITATION OF NONSTEADY PROCESSES IN TWO-  
PHOTON LASER A67-12421
- STEADY STATE REGIME AND STABILITY OF TWO-PHOTON  
LASER, NOTING FIELD DEPENDENCE OF INTENSITY AND  
DURATION OF FREQUENCY PULSE AND RESONANCE  
EXCITATION CURVES A67-14745
- NONLINEAR PROPAGATION OF PULSE SIGNAL IN LASER  
TYPE TRAVELING WAVE AMPLIFIER A67-17232
- IMAS, IA. A.  
LASER RADIATION EFFECT ON METALS, NOTING  
DISINTEGRATION MECHANISM, INDENTATION FORMATION  
AND VAPOR FORMATION A66-39763
- NEODYMIUM GLASS LASER TIME CHARACTERISTICS AND  
SPECTRAL CHANGES DURING CONVERSION TO TRAVELING  
WAVE LASER A67-18782
- NEODYMIUM GLASS LASER WITH SPHERICAL MIRROR  
RESONATOR IN STATIONARY REGIME A67-18783
- INABA, H.  
NONLINEAR QUANTUM EFFECT IN SOLID STATE LASERS  
USING PARAMAGNETIC CRYSTALS, NOTING RAMAN EFFECT  
AND GAIN DEPENDENCE ON PUMPING POWER A66-26172
- ULTRASONIC MODULATION OF LASER OSCILLATION FROM  
NEODYMIUM GLASS ROD A66-28044
- RADIATION INTERACTION BETWEEN LASER OSCILLATORS  
WITH DIFFERENT ACTIVE MATERIALS AND FREQUENCIES  
A66-42549
- INGARDEN, R. S.  
INFORMATION THEORY AND THERMODYNAMICS OF MASERS  
FTD-TT-65-899/1626364 N66-29196
- INGRAHAM, J. C.  
CALCULATIONS AND EXPERIMENTS TO DETERMINE ION WAVE  
INSTABILITY IN STEADY STATE DISCHARGE, LASER  
BREAKDOWN IN PLASMA, AND MICROWAVE SCATTERING  
FROM STANDING PLASMA WAVES N67-14628
- INUISHI, Y.  
PLASMA FLUCTUATION EFFECT ON GAS LASER NOISE,  
NOTING RELATION BETWEEN MODULATION AMPLITUDE OF  
LIGHT OUTPUT AND FREQUENCY NOISE AND OSCILLATION  
SPECTRUM A66-41294
- RATE EQUATIONS FOR GAS DISCHARGE MODULATION OF  
HE- NE LASER A67-19492
- LASER INDUCED PHOTOCONDUCTIVITY IN CADMIUM SULFIDE  
SINGLE CRYSTALS  
REPT.-661 N66-37870
- IRONS, F. E.  
X UV C, TI, MN, FE, NI, CU, ZN AND AR LINE  
SPECTRA AND CONTINUUM RADIATION SPECTRA IN PLASMAS  
PRODUCED BY FOCUSED RUBY LASER BEAM A66-39812
- IRVING, J.  
SCHLIEREN PHOTOGRAPHS OF PLASMA DISCHARGES IN  
PARALLEL PLATE RAIL TUBE, USING PULSED RUBY LASER  
AS LIGHT SOURCE A66-41510
- ISAENKO, V. I.  
FAST-ACTING FLUID SEAL FOR Q-FACTOR MODULATION OF  
NEODYMIUM GLASS LASER A66-27595
- IONIZATION OF AIR WITH LASER RADIATION IN SPIKE  
MODE A66-31150
- FAST-ACTING FLUID SEAL FOR Q-FACTOR MODULATION OF  
NEODYMIUM GLASS LASER A66-42729
- ISAWA, Y.  
RADIATION INTERACTION BETWEEN LASER OSCILLATORS  
WITH DIFFERENT ACTIVE MATERIALS AND FREQUENCIES  
A66-42549
- ISBELL, W. M.  
WRITING RATE OF ROTATING-MIRROR STREAK CAMERA  
DETERMINED, USING Q-SWITCHED LASER TECHNIQUE  
A66-30419
- ISENOR, N. R.  
OBJECT-IMAGE RELATIONSHIPS IN SCATTERED LASER  
LIGHT A67-16792
- ISHCHENKO, V. N.  
RUBY LASER GENERATION FROM TWO R LINES BY  
PRISMATIC LIGHT DISPERSION IN RESONATOR

- A67-13095
- ISMAILOV, I.  
COHERENT EMISSION OF INDIUM ARSENIDE PHOSPHIDE P-N JUNCTION  
A66-31788
- INDIUM PHOSPHIDE BASED SEMICONDUCTOR LASER AMPLIFICATION, LOSS FACTOR AND RADIATION PATTERN  
A67-10065
- COHERENT EMISSION OF INDIUM ARSENIDE PHOSPHIDE P-N JUNCTION  
A67-10101
- TEMPERATURE DEPENDENCE OF THRESHOLD CURRENT IN INJECTION LASERS IN CONTINUOUS OPERATION UNDER LIQUID NITROGEN COOLING  
A67-18788
- ITO, T.  
INTERACTION BETWEEN STIMULATED BRILLOUIN AND RAMAN SCATTERING IN CARBON SULFIDE, USING OPTICAL RESONATOR AND LASER BEAM  
A66-26162
- IVANOV, V. S.  
Ga AS SEMICONDUCTOR QUANTUM GENERATOR HEATING DURING INJECTION PULSE, ANALYZING TEMPERATURE EFFECT ON EXTERNAL QUANTUM OUTPUT AND GENERATOR EFFICIENCY  
A66-41621
- IVEY, H. F.  
ELECTROLUMINESCENCE, DISCUSSING SEMICONDUCTOR LASERS WITH VARIOUS EXCITATION SOURCES, LUMINESCENT EFFICIENCY, ETC  
A67-17889
- IWASAKI, K.  
HIGH TEMPERATURE FLOW CHARACTERISTICS IN FREE PISTON SHOCK TUBE MEASURED BY MEANS OF PULSED LIGHT OF HE- NE GAS LASER  
A66-35353
- IZATT, J. R.  
TEMPERATURE SHIFT OF RUBY LASER EMISSION MEASURED INTERFEROMETRICALLY FOR TEMPERATURES BETWEEN 66 AND 210 DEGREES K  
A66-28701
- IZAWA, Y.  
BEAM SCATTERING, INTERFEROMETRY, AND NONLINEAR GAS EFFECT STUDIES IN GASEOUS MATTER-LASER BEAM INTERACTION EXPERIMENTS  
REPT.-662  
N66-37871
- J
- JACKSON, J. E.  
LASER WELDING FOR ADVANCED ELECTRONIC PACKAGING  
A66-31593
- JACOBS, E. D.  
AMPLITUDE AND FREQUENCY CHARACTERISTICS OF TRAVELING WAVE RING LASER  
A67-15777
- JACOBS, G. B.  
SELF-MODULATION CHARACTERISTICS OF CARBON DIOXIDE LASER AND USE IN MEASURING DETECTOR RESPONSE AND ATMOSPHERIC PROPAGATION CHARACTERISTICS  
A67-14399
- JACOBSON, J. H.  
EFFECTS OF RUBY LASER RADIATION ON OCULAR TISSUE OF RABBITS AND ESTIMATION OF HUMAN CORNEAL THRESHOLD  
FA-R-1815  
N67-10968
- JACOBY, B. F.  
MEASUREMENT OF SINGLE LINE IN P BRANCH OF CARBON DIOXIDE VIBRO-ROTATIONAL ABSORPTION BAND USING TUNED OPTICAL MASER SPECTROSCOPY, NOTING PRESENCE OF SHIFTED FREQUENCIES  
A66-28691
- APPARATUS FOR GENERATION OF INFRARED AND FAR INFRARED NEW LASER LINES  
NASA-CR-80090  
N67-12260
- JAMES, R. N.  
PARTICLE VELOCITY IN GAS PARTICLE TWO-PHASE NOZZLE EXPANSION USING GAS LASER AND FABRY-PEROT INTERFEROMETER FOR ROCKET ENGINE PROPULSION  
AIAA PAPER 66-522  
A66-31500
- JANES, R. B.  
LASERS AND RCA  
A67-19080
- JARRETT, S. M.  
C W IR LASER OSCILLATION IN ATOMIC CL IN H CL AND HI GAS DISCHARGES, NOTING USE OF TWO POWER SUPPLIES AND ENERGY LEVEL DIAGRAM  
A66-28880
- JASEJA, T. S.  
SECOND HARMONIC GENERATIONS AND MIXINGS OF RAMAN LINES PRODUCED IN CYCLOHEXANE, ACETONE, BENZENE AND CARBON DISULFIDE, PHOTOGRAPHING FIRST ORDER STOKES RADIATION  
A67-12052
- JASTRZEBSKI, Z. D.  
NITROGEN-CARBON DIOXIDE 10.6 MICRON LASER FOR OPTICAL TRACKING SYSTEM  
N66-31161
- JAVAN, A.  
OPTICAL- AND I R-MASER SPECTROSCOPY OF INHOMOGENEOUSLY BROADENED RESONANCES, USING GAS LASERS  
A66-26196
- HELIUM-NEON GAS LASER USED TO STUDY PRESSURE EFFECT ON LINE SHAPE OF 2S-2P OPTICAL TRANSITIONS OF NEON EXCITED STATES  
A66-26198
- OUTPUT POWER FREQUENCY RESPONSE OF SINGLE MODE HELIUM NEON LASER, DETERMINING EFFECTS OF ATOMIC COLLISIONS ON FREQUENCY RESPONSE OF INDIVIDUAL ATOMS  
A66-29812
- NONLINEAR ATTENUATION OR GAIN CHARACTERISTICS OF DOPPLER-BROADENED ATOMIC RESONANCE INVOLVING LEVELS WITH SMALL SPLITTINGS, NOTING MODE COUPLING OF GAS LASER  
A67-10152
- GAS LASER SPECTROSCOPIC ANALYSIS OF HYPERFINE STRUCTURE, PARAMAGNETIC PROPERTIES, RADIATIVE LIFETIMES AND DOPPLER-BROADENED TRANSITION SATURATION BEHAVIOR OF EXCITED STATES OF Xe 129  
A67-15462
- MOLECULAR GAS LASER Q-SWITCHING TECHNIQUES, DETERMINING ROTATIONAL COLLISION SECTIONS FOR CARBON DIOXIDE AND CROSS SECTIONS FOR VIBRATIONAL RELAXATION  
A67-16632
- SELF-FOCUSING DUE TO INTENSITY DEPENDENT ANOMALOUS DISPERSION EFFECT ON ELECTROMAGNETIC RADIATION, EMPHASIZING LASER RADIATION IN SATURATED AMPLIFYING MEDIUM  
A67-16649
- RAMAN SCATTERING STUDIES USING CONTINUOUS WAVE OPTICAL MASERS AND SPECTROMETERS  
MIT-DSR-4979  
N66-27897
- GAS LASER RESEARCH, ATOMIC, MOLECULAR, AND INFRARED SPECTROSCOPY TECHNIQUES, AND INTENSE LASER BEAM INTERACTION WITH MATTER  
AFCL-66-727  
N67-19224
- JEFFERS, W. Q.  
118-MICRON WAVELENGTH WATER VAPOR GAS LASER WITH 4-INCH DIAMETER TWO-METER FOCAL LENGTH MIRROR RESONATOR SYSTEM  
A66-29010
- TIME BEHAVIOR OF PULSED WATER VAPOR LASER, NOTING SPIKING FROM FAR IR EMISSION LINES  
A67-20095
- JEFFERTS, K. B.  
OPTICAL FREQUENCY TRANSLATION OF PULSES FROM MODE LOCKED LASER, NOTING DOPPLER SHIFTS OF LARGE MAGNITUDE  
A67-12506
- JELEMSKI, A.  
SINGLE CAVITY MICROWAVE LASER AMPLIFIER ANALYSIS, DETERMINING GAIN, BANDWIDTH, NOISE, CAVITY Q-FACTOR EFFECT AND WIDTH OF MAGNETIC RESONANCE LINE  
A66-37583
- JENNEY, J. A.  
CLEAR AIR TURBULENCE DETECTION WITH LASER RADAR, NOTING AIRBORNE EQUIPMENT AND RESULTS  
A67-15304
- JERPHAGNON, J.  
EMISSION FROM TELLURIUM SINGLE CRYSTAL PUMPED BY TWO WAVES FROM CARBON DIOXIDE LASER  
A67-14914

- JETTON, J. L.  
LASER DOPPLER VELOCIMETER FOR GAS AND LIQUID FLOW  
VELOCITY MEASUREMENT A66-42557
- JOHNSON, F. A.  
PHOTON COUNTING DISTRIBUTIONS AND INTENSITY  
FLUCTUATIONS OF MODULATED LASER BEAMS A67-20125
- JOHNSON, F. M.  
LASER FREQUENCY TUNING BY DIELECTRIC MATERIAL  
INTERACTION TO PRODUCE NONLINEAR EFFECTS A66-26867
- QUENCHING OF STIMULATED RAMAN SCATTERING OF  
COHERENT RADIATION BY TWO-PHOTON ABSORPTION IN  
ORGANIC LIQUIDS A66-43039
- JOHNSON, J. H.  
LIGHT ENERGY MEASUREMENTS MADE WITH ARGON BOMB  
USED AS CHEMICALLY POWERED LASER PUMP A66-35388
- JOHNSON, L. F.  
COHERENT EMISSION FROM TRIVALENT HOLMIUM IONS IN  
RARE EARTH SUBSTITUTED YTTRIUM ALUMINUM GARNET,  
NOTING THREE ENERGY TRANSFER COMBINATIONS IN YAG A66-28690
- FLUORESCENCE OF RARE EARTH, ACTINIDE AND  
TRANSITION METAL IONS IN INSULATING CRYSTALS AS  
RESULT OF OPTICAL EXCITATION, DISCUSSING  
SPECTROSCOPIC PROPERTIES AND OPERATING  
CHARACTERISTICS A66-36969
- FREQUENCY TUNING OF COHERENT EMISSION OVER  
VIBRONIC CONTINUUM OF PHONON-TERMINATED OPTICAL  
MASERS BY THERMAL TUNING AND WAVELENGTH-SELECTIVE  
FEEDBACK A66-41369
- JOHNSON, M. A.  
PROPERTIES OF SELF-TRAPPED LIGHT FILAMENTS NOTING  
STIMULATED RAMAN EMISSION AND CREATION,  
CONTAINMENT AND TERMINATION MECHANISMS A67-16648
- NEW CLASS LIGHT FILAMENT IDENTIFIED IN RAMAN  
RADIATION OF INTENSE RUBY LASER BEAM  
NASA-TM-X-57831 N66-33863
- JOHNSON, M. R.  
OPTICAL PUMPING WITH DIODE LASER INTO FABRY-  
PEROT RESONATOR FACE OF THIN HIGHLY-ABSORBING  
SEMICONDUCTOR, NOTING VARIABLE MODE SPACING  
INCLUDING SINGLE MODE OUTPUT A67-10879
- JUNCTION EFFECTS IN COMPOUND SEMICONDUCTORS  
AFCRL-66-617 N67-15074
- JOHNSON, T. S.  
PULSED RUBIDIUM LASER RANGE MEASUREMENTS WITH  
DELAYED SWEEP OSCILLOSCOPE, AND WITH DIGITAL  
READOUT SYSTEM N66-32075
- JOHNSON, W. B.  
OPTICAL HETERODYNE SYSTEM USED TO MEASURE ELECTRON  
DENSITY OF PLASMA N67-11738  
NASA-CR-79511
- JOHNSTON, T. F., JR.  
GAS LASER PUMPED MICROWAVE EMISSION FOR PRODUCING  
CONTROLLED EXCITED STATE POPULATION FOR RF  
SPECTROSCOPY OF NEON A67-16638
- JONES, A. E.  
RUBY LASER INJURY TO EYE OF MONKEYS, MACACA  
CYNOMOLGUS AND CERCOCEBUS TORQUATUS ATYS A67-80364
- JONES, D. G. C.  
ONSET OF OSCILLATION IN HE- NE LASER ANALYZED  
USING LAMB THEORY, OBTAINING TIME CONSTANT VALUE  
FOR POPULATION OF LOWER LASER LEVEL A67-16821
- JONES, R.  
PHOTON COUNTING DISTRIBUTIONS AND INTENSITY  
FLUCTUATIONS OF MODULATED LASER BEAMS A67-20125
- JORNA, S.  
LINEAR INSTABILITY OF LASER PROPAGATION IN FLUID  
WITH COUPLING BETWEEN LIGHT AND MEDIUM A66-35034
- JUNKER, H.  
THRESHOLD CURRENT DENSITY DEPENDENCY ON PHOTON  
ENERGY IN GALLIUM ARSENIDE LASER DIODES A67-13480
- JUSTH, B.  
READOUT TECHNIQUE FOR LASER FOG DISDROMETER A66-33346
- JUSTICE, R.  
LASER SYSTEM FOR MEASURING SURFACE CONTOURS IN  
LARGE STEERABLE ANTENNAS A66-34296
- ## K
- KAHN, W. K.  
AUDIO FREQUENCY PROPORTIONAL TO ROTATION RATE OF  
REENTRANT LASER CAVITY SYSTEM DERIVED FROM SINGLE  
OUTPUT BEAM A67-11322
- KAISER, R. H.  
SUPERRADIANCE IN N-TYPE GALLIUM ARSENIDE AT ROOM  
TEMPERATURE EXCITED BY ELECTRON BEAM A66-27028
- KALIANOVA, M. P.  
TREATMENT OF STEEL WITH LASER BEAM, OBTAINING  
PRECISION HOLES WITHOUT AFFECTING MICROHARDNESS OF  
METAL A67-18234
- KALITEEVSKII, N. I.  
RADIATIVE POWER AMPLIFICATION OF HE- NE LASER  
WITH NEARLY CONFOCAL RESONATORS A66-41453
- RADIATIVE POWER AMPLIFICATION OF HE- NE LASER  
WITH NEARLY CONFOCAL RESONATORS A67-14190
- KALMYKOV, A. A.  
CLEAVAGE AND SEPARATION OF DYE-DOPED ICE AND  
PARAFFIN INSTANTANEOUSLY HEATED BY LASER PULSE,  
MEASURING MECHANICAL PULSE AT ENERGY  
CONCENTRATIONS BELOW VAPORIZATION HEAT A67-18807
- KAMINOW, I. P.  
ELECTRO-OPTIC LIGHT MODULATION USING PCKEL AND  
KERR EFFECTS IN CRYSTALS FOR COMMUNICATIONS  
APPLICATIONS, USING LASERS A66-42811
- KAMINSKII, A. A.  
STIMULATED EMISSION, ABSORPTION SPECTRA AND  
LUMINESCENCE OF NEODYMIUM-ACTIVATED YAG CRYSTALS  
IN PULSED LASER A66-39306
- CALCIUM FLUORIDE-CERIUM FLUORIDE WITH NEODYMIUM  
ADDITIONS AS ACTIVE MEDIUM FOR LASERS, DISCUSSING  
ABSORPTION AND LUMINESCENCE SPECTRA AND INDUCED  
RADIATION A67-16922
- KAMIRYO, K.  
OPTIMAL DESIGN OF ELLIPTICAL PUMPING CHAMBERS FROM  
NUMERICAL CALCULATIONS CONTAINING ALL GEOMETRIC  
SIZES OF PUMPING LAMPS AND LASER RODS AND  
REFLECTIVITY OF WALLS A67-19490
- KAMOGAWA, T.  
LOW THRESHOLD NEODYMIUM GLASS LASER OSCILLATOR  
WITH HIGH REPETITION A66-33325
- KAMUZ, A. M.  
FRACTURE MECHANISM OF TRANSPARENT CRYSTALS  
INTERACTING WITH RUBY LASER BEAM A67-13128
- KAMUZ, O. M.  
SELF-FOCUSING OF RUBY LASER BEAM IN NA CL  
CRYSTALS A67-12481
- KANNELAUD, J.  
TRANSVERSE AND AXIAL MAGNETIC FIELD EFFECTS ON GAS  
LASERS, DERIVING EXPRESSION FOR ATOMIC AND  
MACROSCOPIC POLARIZATION, DETERMINING OSCILLATION

- MODE CHARACTERISTICS, FREQUENCY RESPONSES, ETC  
A66-29813
- QUENCHING AND HYSTERESIS EFFECTS BETWEEN ZEEMAN  
OSCILLATIONS ON SINGLE AXIAL MODE OBSERVED IN  
NEAR-ZERO MAGNETIC FIELDS FOR SHORT PLANAR LASER  
A66-39116
- KANO, T.**  
OPTIMAL DESIGN OF ELLIPTICAL PUMPING CHAMBERS FROM  
NUMERICAL CALCULATIONS CONTAINING ALL GEOMETRIC  
SIZES OF PUMPING LAMPS AND LASER RODS AND  
REFLECTIVITY OF WALLS  
A67-19490
- KANTORSKI, J. W.**  
NEODYMIUM-GLASS LASER USING SPONTANEOUS  
AMPLIFIED EMISSION IN NONRESONANT SYSTEM TO OBTAIN  
HIGH BRIGHTNESS OUTPUT PULSE  
A67-15100
- KAPLAN, J.**  
CIRCULARLY POLARIZED LASER MODES IN RUBY LASER  
MATERIAL  
N67-17277
- KARAMCHETI, K.**  
VELOCITY DISTRIBUTION FUNCTION MEASUREMENT OF GAS  
BASED ON LASER BEAM ATTENUATION  
SUDAAR-275  
N67-18270
- KARAVAEV, V. V.**  
PARTICLE NUMBER FLUCTUATION IN SINGLE CELL OF  
KASTLER PHOTON SET, DISCUSSING STATISTICAL  
PROPERTIES OF LASER EMISSION IN MULTIMODE  
EXCITATION REGIME  
A67-19599
- KARLOV, N. V.**  
QUANTUM ELECTRONICS, PULSED LASERS, PHOTOEFFECTS,  
LASER EMISSION, AND FIELD THEORY - CONFERENCE  
REPORT  
FTD-HT-66-458  
N67-17910
- KARNAUKHOV, V. G.**  
MINIMUM SPECTRAL LINE WIDTH, THRESHOLD CURRENT  
DENSITY, RADIATION-PEAK DISPLACEMENT AND POSSIBLE  
RECOMBINATION MECHANISM FOR GA SB LASER DIODE P-N  
JUNCTIONS IN COHERENT RADIATION  
A66-31764
- MINIMUM SPECTRAL LINE WIDTH, THRESHOLD CURRENT  
DENSITY, RADIATION-PEAK DISPLACEMENT AND POSSIBLE  
RECOMBINATION MECHANISM FOR GA SB LASER DIODE P-N  
JUNCTIONS IN COHERENT RADIATION  
A67-10085
- KARNEY, J. L.**  
LASER SYSTEM FOR METEOROLOGICAL DATA USING  
OSCILLOSCOPE TO DISPLAY RETURN SIGNAL, TRANSLATED  
AS CONCENTRATIONS OF MATTER OR AEROSOLS  
A66-43044
- LASER RADAR RETURNS FROM LOWER TROPOSPHERE  
COMPARED WITH VERTICAL OZONE DISTRIBUTIONS  
INDICATE INVERSE RELATIONSHIP  
A67-14676
- SMALL LASER RADAR APPLIED TO METEOROLOGICAL  
STUDIES  
PMR-TM-66-6  
N67-12294
- KARP, S.**  
OPTICAL SURFACE ROUGHNESS MEASUREMENT USING  
COHERENT RADIATION PRODUCED BY HELIUM-NEON LASER  
SIGMA-POLARIZED AT 6328 ANGSTROMS  
A67-10020
- KARUBE, N.**  
LASER OSCILLATION WITH TOTALLY REFLECTING ROOF  
PRISM AS CAVITY, NOTING OUTPUT VS MIRROR ALIGNMENT  
FOR TWO ROTATION AXES  
A66-29414
- KASUYA, T.**  
STIMULATED EMISSION IN TRIPLET SYSTEM OF NITROGEN  
MOLECULE PRODUCED BY PULSED LASER DISCHARGE,  
IDENTIFYING LINES AND INTERPRETING INTENSITY  
DISTRIBUTION IN ROTATIONAL BAND SPECTRUM  
A67-16785
- KATS, L. I.**  
OUTPUT POWER OF CW LASER MEASURED BY WIRE  
BOLMETER IN FORM OF PLANE SINGLE-LAYER SPIRAL AS  
SENSITIVE ELEMENT  
A66-35321
- KATULIN, V. A.**  
SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-  
PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION  
A66-27187
- GENERATION IN CADMIUM SULFIDE DURING TWO-PHOTON  
OPTICAL EXCITATION BY RUBY LASER WITH MODULATED  
Q-FACTOR  
A66-33134
- SPECTRAL CHARACTERISTICS OF TWO-PHOTON OPTICAL  
EXCITATION AND LIGHT EMISSION FROM CD SE  
SEMICONDUCTOR LASER WITH MODULATED Q-FACTOR  
A66-37565
- SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-  
PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION  
A66-43085
- SPECTRAL CHARACTERISTICS OF TWO-PHOTON OPTICAL  
EXCITATION AND LIGHT EMISSION FROM CD SE  
SEMICONDUCTOR LASER WITH MODULATED Q-FACTOR  
A67-15299
- SEMICONDUCTOR LASERS USING SINGLE AND DOUBLE  
PHOTON OPTICAL EXCITATION  
A67-18930
- KATZENSTEIN, J.**  
COOPERATIVE SCATTERING OF LASER LIGHT BY THETATRON  
PLASMA  
A66-35489
- SCATTERED LIGHT SPECTRUM IN THETATRON PLASMA,  
NOTING ONSET OF ION WAVE INSTABILITY  
A67-10248
- FREQUENCY DISTRIBUTION MEASUREMENTS OF RUBY LASER  
LIGHT SCATTERED BY THETATRON PLASMA  
CLM-P-104  
N66-35301
- KAUFMAN, J. C.**  
PROTECTION AND HAZARD TO EYES OF UNINFORMED  
OPERATORS AND BYSTANDERS FROM LASER LIGHT  
A66-27668
- KAWABE, K.**  
PLASMA FLUCTUATION EFFECT ON GAS LASER NOISE,  
NOTING RELATION BETWEEN MODULATION AMPLITUDE OF  
LIGHT OUTPUT AND FREQUENCY NOISE AND OSCILLATION  
SPECTRUM  
A66-41294
- RATE EQUATIONS FOR GAS DISCHARGE MODULATION OF  
HE- NE LASER  
A67-19492
- KAWAJI, A.**  
SELECTIVE DIFFUSED JUNCTION LASER, DISCUSSING  
GA AS LASER USED FOR QUENCHING EXPERIMENT  
A66-32408
- KAY, N. D.**  
LASER ILLUMINATED ELECTRO-OPTICAL IMAGING NOTING  
ENERGY VARIATION PARAMETERS, EQUIPMENT USED AND  
RESULTS OBTAINED IN TV RECEPTION  
A66-35531
- KAZANSKII, B. A.**  
LASER BEAM EFFECT ON BENZENE AND OTHER ORGANIC  
COMPOUNDS, NOTING FORMATION OF DARK READILY  
COAGULATING DEPOSIT  
A67-17028
- KAZANTSEV, A. P.**  
TRAVELING WAVES INTERACTION IN GAS LASER,  
EXPLAINING FORCING-QF-OSCILLATIONS AND TRAVELING  
WAVE SUPPRESSION EFFECT  
A66-34685
- TRAVELING WAVES INTERACTION IN GAS LASER,  
EXPLAINING FORCING-QF-OSCILLATIONS AND TRAVELING  
WAVE SUPPRESSION EFFECT  
A67-14371
- KAZMIROWSKI, A.**  
NEODYMIUM DOPED OPTICAL GLASSES FOR LASER  
TECHNOLOGY  
A67-16855
- KEHL, D.**  
SECOND HARMONIC GENERATED BY TRANSMITTING LASER  
RADIATION THROUGH TELLURIUM MONOCRYSTAL, WHILE  
FILTERING OUT FUNDAMENTAL FREQUENCY  
A66-25437
- KEIPER, A.**  
SPECTRAL ANALYSIS OF EMISSION OF SPATIALLY



- SEPARATED SPOTS IN GA AS INJECTION LASERS  
A67-20185
- KELLER, D. V.  
HIGH POWER NONSPIKING OPERATION OF RUBY LASER FOR  
CONTINUOUS OUTPUT ON MICROSCOPIC AND MACROSCOPIC  
SCALE  
A66-38242
- KELLEY, J. G.  
THYMAN- GREEN ARRANGEMENT OF INTERFEROMETER WITH  
NARROW LASER BEAM AND TWIN PHOTOMULTIPLIERS,  
EXAMINING STRONG SHOCKS IN ARGON IN 15.2 CM SHOCK  
TUBE  
A67-12688
- KELLEY, P. L.  
DEGENERATE STIMULATED FOUR-PHOTON INTERACTION AND  
FOUR-WAVE PARAMETRIC AMPLIFICATION OBSERVED IN  
RUBY LASER AND LIQUID CELL ARRANGEMENTS  
A67-16379
- SELF-FOCUSING DUE TO INTENSITY DEPENDENT ANOMALOUS  
DISPERSION EFFECT ON ELECTROMAGNETIC RADIATION,  
EMPHASIZING LASER RADIATION IN SATURATED  
AMPLIFYING MEDIUM  
A67-16649
- KELOV, K.  
RESONATOR MISALIGNMENT EFFECT ON OUTPUT OF NEON-  
HELIUM LASER WITH SPHERICAL MIRRORS  
A66-41830
- KENNEDY, J. R.  
LASER WELDING OF AEROSPACE STRUCTURAL ALLOYS AND  
RESULTANT JOINT PROPERTIES  
A66-26019
- KENT, G. S.  
HIGH ALTITUDE ATMOSPHERIC SCATTERING OF INTENSE  
LIGHT FROM RUBY LASER BEAM INTERPRETED PRINCIPALLY  
IN TERMS OF RAYLEIGH SCATTERING FROM ATMOSPHERIC  
MOLECULES  
A67-19419
- KERN, S.  
HYPERSONIC EXCITATIONS DUE TO BRILLOUIN  
SCATTERING FOR CASE WITH STOKES FEEDBACK,  
DERIVING QUANTUM EQUATION OF MOTION FOR CREATION  
OF LASER AND STOKES MODES AND COUPLED ACOUSTIC  
MODE  
A67-16683
- KERR, J. R.  
F M LASER AND OPTICAL HETERODYNES IN OPTICAL  
COMMUNICATION SYSTEMS  
A66-26004
- KESSLER, B. V.  
TIME RESOLVED AND TIME INTEGRATED MEASUREMENTS OF  
PLASMA PRODUCED BY Q-SWITCHED LASER BEAM  
FOCUSED ON SURFACE OF METALLIC SOLID  
NOLTR-66-96  
N67-17906
- KESSLER, H.  
SURFACE ASPECTS OF THERMAL DEGRADATION OF GA AS  
P-N JUNCTION LASERS AND TUNNEL DIODES  
A67-15620
- KESSLER, H. K.  
COOLER FOR SEMICONDUCTOR LASERS AND PHOTODETECTORS  
USING LOW TEMPERATURE GAS  
A66-26559
- SHALLOW DONOR INTRODUCTION IN P-TYPE GA- AS LASER  
RESULTS IN INCREASED EFFICIENCY OF RADIATIVE  
RECOMBINATION  
A67-17280
- GALLIUM ARSENIDE LASER OUTPUT INCREASE DUE TO  
ALUMINUM EVAPORATED COATING ON SILICON DIOXIDE  
USED AS REFLECTIVE COATING  
A67-19794
- KESTIGIAN, M.  
TEMPERATURE DEPENDENCE OF THRESHOLD FOR STIMULATED  
EMISSION OF ND TRIVALENT ION IN SEVERAL HOST  
LATTICES ESTIMATED FROM INTENSITY VARIATION OF  
LASER ACTIVE FLUORESCENCE COMPONENT  
A67-11085
- KHAIKIN, A. S.  
ATOMIC COLLISIONS, EXCITATION TRANSFER PROCESSES  
AND ENERGY LEVEL TRANSITION PROBABILITIES IN  
PLASMA OF GAS LASERS  
A66-39305
- KHEIFETS, M. I.  
DEGREE OF EXCITATION OF METASTABLE STATE  
DETERMINED, USING LUMINESCENCE SATURATION
- PHENOMENON, CALCULATING POPULATION OF WORKING  
LEVEL OF LASER SUBSTANCE  
A66-30846
- TWO-PHOTON LASER EXCITATION CONDITIONS  
DETERIORATED BY PRESENCE OF RESONATOR TUNED ON  
TRANSITION FREQUENCY BETWEEN OPERATING LEVELS OF  
MATTER  
A66-37143
- FREQUENCY DOUBLING IN RESONANCE LASER, OBTAINING  
SECOND HARMONIC FIELD FOR LASER RADIATION BY GIANT  
PULSES  
A66-37144
- KHODOVOI, V. A.  
FREQUENCY SHIFT IN RESONANCE TRANSITION INDUCED IN  
POTASSIUM VAPOR BY RUBY LASER PULSE  
A66-25103
- FREQUENCY SHIFT IN RESONANCE TRANSITION INDUCED  
IN POTASSIUM VAPOR BY RUBY LASER PULSE  
A66-30282
- RESONANT BIREFRINGENCE IN POTASSIUM VAPOR UNDER  
INFLUENCE OF ELECTRIC FIELD OF RUBY LASER EMISSION  
A66-36066
- KHOKHLOV, R. V.  
LIGHT FREQUENCY MULTIPLIERS FOR NONLINEAR OPTICAL  
EFFECTS AT VARIOUS WAVELENGTHS, CONSIDERING  
FOCUSING, LASER BEAM FINITE DIVERGENCE, AIR  
BREAKDOWN, STIMULATED RAMAN EMISSION, ETC  
A66-26146
- PARAMETRIC AMPLIFIERS AND LASERS  
A66-28358
- GAS DISCHARGE BY LASER PULSE, TAKING INTO ACCOUNT  
PHOTOIONIZATION DUE TO ELECTRON IMPACT  
A66-41094
- CONSISTENT THEORY OF NONLINEAR OPTICAL EFFECTS IN  
BOUNDED LIGHT BEAMS BY EXTENDING PARABOLIC  
EQUATIONS TO NONLINEAR PROBLEMS  
A66-41095
- SINGLE MODE APPROXIMATION OF PARAMETRIC EXCITATION  
AND SELF-EXCITATION OF OSCILLATIONS IN FABRY-  
PEROT RESONATOR FILLED WITH NONLINEAR DISPERSIVE  
MEDIUM  
A67-11575
- PARAMETRIC AMPLIFIERS AND LASERS  
A67-16361
- NONLINEAR PROPAGATION OF PULSE SIGNAL IN LASER  
TYPE TRAVELING WAVE AMPLIFIER  
A67-17232
- RAMAN GENERATOR FOR AMPLIFICATION AND GENERATION  
OF COHERENT RADIATION  
N67-11314
- KHONAZA, V. F.  
HELIUM-NEON LASER ASSESSMENT AS SOURCE IN HIGH  
PRECISION RANGE MEASUREMENTS  
A66-35362
- KHROMOV, A. V.  
VOLUME DENSITY OF HEAT SOURCES IN RUBY LASER ROD  
BY NUMERICAL INTEGRATION OF PUMPING AND ABSORPTION  
SPECTRA  
A67-13117
- KHRONOPULO, IU. G.  
TWO-PHOTON LASER EXCITATION CONDITIONS  
DETERIORATED BY PRESENCE OF RESONATOR TUNED ON  
TRANSITION FREQUENCY BETWEEN OPERATING LEVELS OF  
MATTER  
A66-37143
- FREQUENCY DOUBLING IN RESONANCE LASER, OBTAINING  
SECOND HARMONIC FIELD FOR LASER RADIATION BY GIANT  
PULSES  
A66-37144
- KHVOSHCHIEV, A. N.  
GALLIUM ARSENIDE LASERS OPERATING AT ROOM  
TEMPERATURE INVESTIGATED, BASED ON DIFFUSION P-N  
JUNCTIONS, DISCUSSING EMISSION SPECTRUM  
A66-36070
- KIEFER, J. E.  
SELECTIVE ACCESS LASER DISPLAY BEAM POSITIONER  
RADC-TR-66-447  
N67-15327
- KIESS, E. M.  
BRILLOUIN SPECTRA OF ACETONE, ETHYL ALCOHOL,

- WATER, CARBON BISULFIDE, TOLUENE, AND CARBON  
TETRACHLORIDE USING HELIUM-NEON LASER AND  
PHOTOELECTRIC DETECTION N66-35529
- KILCLINE, C. R.  
NANOSECOND PULSE LIGHT SOURCES USED IN FREE FLIGHT  
HYPERSONICS FOR BALLISTIC RANGE MEASUREMENTS,  
NOTING LESS PHOTOGRAPHIC BLURRING OF MOTION A67-18881
- KILLICK, D. E.  
ENERGY AND POWER OF Q-SWITCHED NEODYMIUM GLASS  
LASER MEASURED, USING CALORIMETRIC DEVICES,  
VACUUM PHOTODIODES, ETC A66-34904
- U V RADIATION GENERATION FROM OUTPUT OF ND GLASS  
LASER BY FREQUENCY DOUBLING IN AMMONIUM DIHYDROGEN  
PHOSPHATE CRYSTALS A67-18712
- KIM, P. H.  
ENERGIES OF IONS GENERATED FROM METAL SURFACE  
IRRADIATED BY SINGLE GIANT PULSE LASER A66-38412
- KIMURA, T.  
DEMODULATION METHOD IN WHICH PHASE MODULATION OF  
LASER BEAM IS CONVERTED TO AMPLITUDE MODULATION  
BY AUTOCORRELATION A66-30616
- KINDLMANN, P. J.  
ABSOLUTE DIRECT EXCITATION CROSS SECTION FROM  
NEUTRAL GROUND STATE FOR UPPER LEVELS OF  
TRANSITION IN ARGON LASER A67-12520
- KING, P. G. R.  
RING LASER ROTATION SENSING SYSTEM, EVALUATING  
ACCURACY LIMIT FOR MINIMIZED INACCURACY OF  
KNOWN SOURCES OF ERROR A67-13992
- KINSEL, T. S.  
OPTICAL MODULATOR USING ELECTRO-OPTIC EFFECT IN  
LITHIUM TANTALATE FOR PCM TRANSMISSION SYSTEMS  
OPERATING AT 224 MEGACYCLE BIT RATE A67-10013
- KIRICHINSKIY, B. R.  
BIOLOGICAL EFFECTS AND DOSIMETRY OF ABSORBED  
RADIATION FROM RUBY LASER N66-37710
- KIRIN, IU. M.  
RUBY LASER FREQUENCY CONVERSION TECHNIQUE BY LASER  
BEAM SCATTERING AND MIXING OF COMBINED FREQUENCIES  
A67-13094
- KIRSANOV, B. P.  
TWO-QUANTA ABSORPTION AND SCATTERING LOSS IN  
POWERFUL LASER A66-29350
- TWO-QUANTA ABSORPTION AND SCATTERING LOSS IN  
POWERFUL LASER A66-37355
- KISS, Z. J.  
CRYSTALLINE SOLID LASERS, CONSIDERING RARE EARTH  
AND TRANSITION METAL IMPURITIES AND HOST  
MATERIALS, NOTING CW LASER CHARACTERISTICS  
A66-42799
- KITAEVA, V. F.  
ELECTRON TEMPERATURE IN ELECTRIC DISCHARGE  
APPLIED TO ARGON ION LASER A67-10550
- ELECTRON TEMPERATURE IN ELECTRIC DISCHARGE APPLIED  
TO ARGON ION LASER A67-11058
- ARGON DISCHARGE CHARACTERISTICS USED IN CONTINUOUS  
ACTION ION LASER FOR ANALYSIS OF INVERSION  
PRODUCTION MECHANISM A67-16680
- KITZMILLER, K. W.  
PARTIAL INHIBITION OF LASER REACTION IN MAN BY  
TOPICAL CORTICOSTEROIDS A67-80434
- KLEIN, C. A.  
EXCITATION IN ELECTRON BEAM PUMPED / EBP/ GA AS  
LASERS INCLUDING ELECTRON SCATTERING, ENERGY  
DISSIPATION PATTERN, PHONON EMISSION, PAIR  
PRODUCTION, ETC A66-26181
- STIMULATED EMISSION BY ELECTRON BEAM BOMBARDMENT
- OF LASER MATERIALS A67-14394
- KLEIN, E.  
OPTICAL RAY TRACING TO PREDICT FOCUSING  
CHARACTERISTICS OF LASER LIGHT IN REFRACTIVE  
TARGETS, CALCULATING HEATING EFFECTS IN TARGET,  
NOTING TARGET GEOMETRY, REFRACTIVE INDEX,  
THICKNESS OF SKIN LAYERS, ETC A66-25531
- KLEINMAN, D. A.  
SECOND HARMONIC GENERATION / SHG/ BY FOCUSED LASER  
BEAMS IN NONLINEAR CRYSTALS A66-29816
- SECOND-HARMONIC GENERATION BY FOCUSED LASER BEAMS  
BASED ON EXPERIMENTS USING HE-NE GAS LASER,  
NOTING SHG SHOULD BE STRONGLY PEAKED WHEN FOCUS  
IS AT EITHER OF CRYSTAL SURFACES A66-38554
- SECOND HARMONIC GENERATION OF LIGHT BY FOCUSED  
LASER BEAMS IN NONLINEAR CRYSTALS AT EXIT SURFACE  
A67-16640
- KLEMAN, B.  
BREAKDOWN BY NEODYMIUM GLASS LASER RADIATION IN  
ATOMIC AND MOLECULAR GASES, DETERMINING POWER  
DENSITIES, NOTING RELATION OF PRESSURE TO  
BREAKDOWN POWER A66-30938
- IDENTIFICATION OF NUMBER OF LINES AT 11 MICRONS  
EMITTED FROM PULSED CARBON DIOXIDE LASER AS P  
BRANCH OF CARBON DIOXIDE VIBRATIONAL TRANSITION  
A66-37629
- KLEMAS, K.  
KERR CELL PROPERTIES NOTING FOUR-ELECTRODE CELL  
GIVING FREQUENCY SHIFT OF 60 MC FOR LASER BEAM  
A67-19552
- KLEMENTEV, V. M.  
OPTICAL RESONATOR USING CYLINDRICAL MIRROR WITH  
VARIABLE RADIUS OF CURVATURE A66-29703
- KLEWE, R. C.  
MERCURY, CESIUM AND RUBIDIUM VAPORS IONIZATION IN  
INTENSE RADIATION FLUX BY Q-SWITCHED RUBY LASER  
A66-41156
- KLINONTOVICH, IU. L.  
WAVE SYNCHRONIZATION IN GAS LASER WITH RING  
RESONATOR CAVITY A66-39301
- INTERBAND ELECTRON ABSORPTION AND DISPERSION  
DURING ONE- AND TWO-PHOTON PROCESSES IN  
SEMICONDUCTORS SUBJECTED TO ELECTROMAGNETIC FIELD,  
NOTING LASER APPLICATIONS A67-18798
- KLOCKENKAMPER, R.  
RUBY LASER MODE SELECTION AND PULSE AMPLIFICATION  
IPP-4/49 N66-38698
- KLOHN, K. L.  
MATHEMATICAL MODEL OF GA AS INJECTION LASER  
APPLIED IN DETERMINING MAXIMUM OBTAINABLE POWER  
OUTPUT, USING RATE EQUATIONS OF ELECTRON AND  
PHOTON DENSITIES AND THERMAL RESISTANCE FOR  
OPTIMUM VALUE A66-26572
- P-N JUNCTION LASERS FOR SHORT RANGE  
COMMUNICATIONS, EXAMINING DESIGN, TECHNOLOGICAL  
PROBLEMS AND PERFORMANCE A66-31956
- SEMICONDUCTOR LASER ARRAY STRUCTURE WITH COMMON  
N-TYPE SUBSTRATE AND INDIVIDUAL CONTACTS TO  
P-LAYER FOR HIGHER OPTICAL POWER OUTPUT  
A67-10023
- GALLIUM ARSENIDE INJECTION LASER OPTIMIZATION  
FOR MAXIMUM POWER OUTPUT  
ECOM-2613 N66-24779
- KLUEVER, J. W.  
SPONTANEOUS EMISSION NOISE POWER ADDED TO  
AMPLIFIED SIGNAL IN LASER AMPLIFIER IN HE-NE GAS  
DISCHARGE AND SATURATION RELATION TO POPULATION  
INVERSION A66-38387
- KLYSHKO, D. N.  
PHOTOCONDUCTIVITY INDUCED IN UNCOLORED SODIUM

- CHLORIDE AND ALUMINUM OXIDE SINGLE CRYSTALS BY  
RADIATION FROM RUBY LASER A66-33939
- KMENT, V.  
INTERFERENCE MEASUREMENT OF HOMOGENEITY OF RUBY  
RESONATOR FOR LASER A67-11161  
FTD-TT-66-44
- KNAB, O. D.  
SURFACE EFFECT ON TEMPERATURE, I-V AND WATT-  
AMPERE CHARACTERISTICS OF P-N JUNCTION  
SEMICONDUCTOR INJECTION LASER DIODE AS COHERENT  
LIGHT SOURCE A67-10077
- KNECHT, W. L.  
SURFACE TEMPERATURE DETERMINATION PROCEDURE FOR  
LASER HEATED METALS BASED ON HEAT CONDUCTION  
EQUATIONS AND ION EMISSION FROM SURFACE A66-29035
- TIME RESOLUTION OF LASER-INDUCED ELECTRON EMISSION  
FROM CESIUM DIODE AT HIGH LASER POWER A66-31135
- LASER INDUCED SPONTANEOUS ELECTRON EMISSION FROM  
REAR SIDE OF METAL FOILS, NOTING ELECTRON ENERGY  
VS LASER ENERGY PULSE MAGNITUDE, ETC A66-31536
- KNEUBUEHL, F. K.  
LASER EMISSION INTERFEROGRAMS OBTAINED WITH  
FABRY-PEROT CROSS-GRATING INTERFEROMETER IN  
SUBMILLIMETER WAVELENGTH RANGE A66-37546
- SUBMILLIMETER LASER EMISSION FROM ICN NOTING  
INTERFEROGRAMS A66-37547
- KNIGHT, S.  
OPTICAL MODULATION IN BULK GALLIUM ARSENIDE, USING  
GUNN EFFECT A66-33606
- KNUDSEN, C. A.  
LASER RADAR RETURNS FROM LOWER TROPOSPHERE  
COMPARED WITH VERTICAL OZONE DISTRIBUTIONS  
INDICATE INVERSE RELATIONSHIP A67-14676
- KOBAYASHI, T.  
ULTRASONIC MODULATION OF LASER OSCILLATION FROM  
NEODYMIUM GLASS ROD A66-28044
- KOBZEV, V. V.  
BOOK ON LASER APPLICATIONS IN RADIO COMMUNICATION  
SYSTEMS A66-43226
- KOCH, N.  
SOLAR NOISE IN OPTICAL COMMUNICATIONS, BACKGROUND  
RADIATION DEPENDENCE ON DETECTOR APERTURE, NOISE  
POWER AND APPLICATION TO GA AS DIODES AND GAS  
LASERS A66-25833
- KOESTER, C. J.  
RETINAL LESIONS PRODUCED BY RUBY LASER IN RABBITS  
AND HUMANS A66-82224
- PASSIVE CORE FIBER LASER DOES NOT REMOVE  
COMPLETELY NEED FOR OPTICAL QUALITY IN CLADDING  
MATERIAL A67-16666
- KOGAN, L. M.  
RECOMBINATION RADIATION FROM GA AS P-N  
JUNCTIONS WITH AND WITHOUT FABRY-PEROT  
RESONATOR, NOTING PARAMETER DEPENDENCE ON CURRENT  
DENSITY A66-40314
- VOLT-AMPERE CHARACTERISTICS AND OTHER PROPERTIES  
OF GA AS LASERS WITH TELLURIUM AND ZN-DOPED  
EPITAXIAL P-N JUNCTION A67-10080
- CONTINUOUS COHERENT RADIATION OF GA AS  
SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT  
AMBIENT TEMPERATURE OF 77 DEGREES K A67-10548
- CONTINUOUS COHERENT RADIATION OF GA AS  
SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT  
AMBIENT TEMPERATURE OF 77 DEGREES K A67-11056
- KOGELNIK, H.  
MODE THEORY OF SPHERICAL MIRROR RESONATORS,  
DISCUSSING DIFFRACTION LOSSES, RESONANT  
CONDITIONS, MODE PATTERNS, INTERNAL FOCUSING  
ELEMENTS, MODE SELECTION, ETC A66-36972
- LASER BEAMS AND RESONATORS, DISCUSSING BEAM  
PROPAGATION IN FREE SPACE, GEOMETRICAL OPTICS  
APPLICATION AND RESONATOR MODES IN VIEW OF  
APERTURE DIFFRACTION EFFECTS A66-42806
- KOHN, E. S.  
INTERNALLY SCANNED LASER BEAM HAVING HIGH  
DEFLECTION RATE PRODUCED BY PULSED OPTICAL DELAY  
LINE A67-16647
- KOHN, R. L.  
SECOND-HARMONIC ENHANCEMENT IN NONLINEAR CRYSTAL  
BY LOSS MODULATOR COUPLING OF PULSED RUBY LASER  
MODES A66-31939
- COUPLING OF ADJACENT AXIAL MODES IN EXTERNAL  
RAMAN RESONATOR OBSERVED AS FIRST STOKES  
FREQUENCY WITH BENZENE AS RAMAN MEDIUM AND Q-  
SWITCHED RUBY LASER AS PUMP SOURCE A66-39109
- MODE COUPLING IN RUBY LASER WITH REACTANCE PLACED  
WITHIN CAVITY RESONATOR WITH MODULATION FREQUENCY  
CLOSE TO SEPARATION OF AXIAL MODES, EXAMINING  
ELECTRIC FIELD ENVELOPE A66-42565
- KOKORA, A. N.  
TREATMENT OF STEEL WITH LASER BEAM, OBTAINING  
PRECISION HOLES WITHOUT AFFECTING MICROHARDNESS OF  
METAL A67-18234
- KOKURIN, I. U. L.  
MEASUREMENT OF DISTANCE TO MOON BY OPTICAL  
RADAR, DISCUSSING RUBY LASER/PHOTOMULTIPLIER  
APPARATUS AND PROCEDURE A66-30291
- LUNAR FIGURE AND ORBIT PARAMETERS MEASURED BY  
OPTICAL LOCATION METHOD A66-35285
- KOKURIN, YU. L.  
DESCRIPTION OF RUBY LASER USED IN OPTICAL LOCATION  
OF MOON NASA-TT-F-8866 N66-29428
- KOLB, A. C.  
ION LASER EXPERIMENTS, MOLECULAR NITROGEN LASER,  
AND GAS LASER THEORY N67-12649
- KOLESNIK, V. M.  
BIOLOGICAL EFFECTS AND DOSIMETRY OF ABSORBED  
RADIATION FROM RUBY LASER N66-37710
- KOLESNIKOV, V. N.  
DEVELOPMENT OF OPTICAL QUANTUM GENERATOR FROM  
HIGHLY IONIZED LOW TEMPERATURE TO CONVERT HEAT  
ENERGY INTO ELECTRIC AND COHERENT LIGHT  
RADIATION ENERGIES FOR USE IN LASER  
JPRS-39659 N67-18113
- KOLKER, M.  
SYSTEM DESIGN ANALYSIS OF LASER METHODS OF DEEP  
SPACE COMMUNICATION, EXAMINING LOCAL HETERODYNE  
SYSTEM / LHS/, DIRECT DETECTION SYSTEM / DDS/ AND  
TRANSMITTED REFERENCE SYSTEM A66-35666
- SYSTEM DESIGN ANALYSIS OF LASER METHODS OF DEEP  
SPACE COMMUNICATION, EXAMINING LOCAL HETERODYNE  
SYSTEM / LHS/, DIRECT DETECTION SYSTEM / DDS/ AND  
TRANSMITTED REFERENCE SYSTEM A67-17635
- KOLLBERG, E.  
THEORETICAL EXISTENCE OF OPTIMUM PITCH GIVING  
MAXIMUM NET GAIN FOR TRAVELING WAVE MASERS, USING  
SLOW WAVE STRUCTURES A66-27958
- KOLOMNIKOV, I. U. D.  
OPTICAL RESONATOR USING CYLINDRICAL MIRROR WITH  
VARIABLE RADIUS OF CURVATURE A66-29703
- KOLYCHEV, N. N.  
LASER TYPE REGIME OF SEMICONDUCTOR HAVING  
RADIATION INDUCED BY IMPURITY BAND TRANSITIONS OF  
CURRENT CARRIERS A67-13137

## KOMAI, L. G.

OPTICAL LENGTH VARIATIONS IN LASER AMPLIFIERS  
DETERMINED DURING PUMPING AND AMPLIFICATION, USING  
INTERFEROMETRY A66-25999

DYNAMIC OPTICAL PROPERTIES OF LASER MATERIALS  
P66-134 N66-35125

## KONINGSTEIN, J. A.

LASER EXCITED ELECTRONIC RAMAN SPECTRUM OF  
TRIVALENT EU ION DOPED Y GA GARNET A67-11084

## KONIUKHOV, V. K.

CD S SINGLE CRYSTAL OPTICAL GENERATOR DURING  
EXCITATION BY RUBY LASER, DISCUSSING TWO-PHOTON  
ABSORPTION COEFFICIENT AT 300 DEGREES K FOR  
RADIATION FLUX DENSITIES A66-27576

STIMULATED EMISSION FROM SAMARIUM-DOPED CALCIUM  
FLUORIDE CRYSTAL EXCITED BY RUBY LASER A66-29358

LASER REGIME WITH GIANT PULSES GENERATED IN  
DYSPROSIUM DOPED CADMIUM FLUORIDE UNDER CONTINUOUS  
PUMPING BY XENON LAMPS, OBTAINING Q FACTOR  
MODULATION BY ROTATING PRISM A66-34178

STIMULATED EMISSION FROM SAMARIUM-DOPED CALCIUM  
FLUORIDE CRYSTAL EXCITED BY RUBY LASER A66-37362

DIVALENCE SAMARIUM ION DOPED CALCIUM FLUORIDE  
LASER ACTION AT LOW TEMPERATURES OBTAINED WITH  
GIANT PULSE RUBY LASER EXCITATION A67-16661

## KONJEVIC, N.

AMPLITUDE OF LF OSCILLATIONS IN HE- NE LASER  
A67-16948

## KONNERTH, K.

SEMICONDUCTOR INJECTION LASERS  
REPT.-8 N66-27687

## KONSTANTINOV, V. B.

INTERFERENTIAL METHOD OF TESTING HIGH RESOLUTION  
PHOTOGRAPHIC EMULSIONS, USING LASER AS LIGHT  
SOURCE A67-10832

## KOOZEKANANI, S.

INEXPENSIVE CARBON DIOXIDE MOLECULAR GAS LASER  
USING PLANO-CONCAVE EYEGLASS LENSES A67-10827

## KOOZEKANANI, S. H.

TRANSITION PROBABILITIES AND LIFETIMES IN IONIZED  
ARGON GAS LASERS A66-26207

ENERGY LEVELS OF SIMPLE MOLECULAR GASES FOR  
POSSIBLE MOLECULAR LASER MATERIAL  
NASA-CR-80832 N67-14212

## KOPYLOVSKII, B. D.

GA AS SEMICONDUCTOR QUANTUM GENERATOR HEATING  
DURING INJECTION PULSE, ANALYZING TEMPERATURE  
EFFECT ON EXTERNAL QUANTUM OUTPUT AND GENERATOR  
EFFICIENCY A66-41621

SPONTANEOUS AND INDUCED COHERENT RADIATION FROM  
INDIUM ANTIMONIDE ELECTRON-HOLE PLASMA A67-10088

## KORENMAN, V.

QUANTUM THEORY OF LASERS PRESENTED IN TERMS OF  
CORRELATION FUNCTIONS OF SECOND-QUANTIZED  
ELECTROMAGNETIC AND MATTER FIELDS A66-26214

GENERAL NONEQUILIBRIUM SYSTEM IN CONTACT WITH  
RESERVOIR DESCRIBED VIA CORRELATION FUNCTIONS OF  
QUANTIZED FIELD OPERATORS, NOTING INFLUENCE OF  
CAVITY AND OPTICAL PUMP A66-38633

## KORNEEVA, O. G.

MEASUREMENT OF RADIATION PATTERN OF RUBY LASER  
EMISSION FOR VARIOUS RESONATORS AND OPERATING  
REGIMES, NOTING LASER EFFECT ON ANGULAR HALF-  
WIDTH VALUES A66-30847

## KOROBKIN, V. V.

DYNAMICS OF FIELD AND GENERATION FREQUENCIES IN  
GIANT PULSE OF RUBY LASER WITH PASSIVE SHUTTER,  
USING SOLUTION OF CRYPTOCYANINE IN ETHANOL, NOTING  
MIRROR REFLECTION COEFFICIENT A66-29727

MAGNETIC DIPOLE MOMENT IN SPARK PRODUCED BY  
FOCUSING LASER RADIATION A66-43055

## KOROLEV, F. A.

RUBY LASER MONOCHROMATIC RADIATION SEPARATION BY  
TAPERED MULTIPLEX INTERFEROMETER WITH OPPOSITION  
DISPERSION A66-26471

OBTAINING HIGHLY MONOCHROMATIC RADIATION ON SINGLE  
WAVE FROM RUBY LASER A66-21809

RESONATOR MISALIGNMENT EFFECT ON OUTPUT OF NEON-  
HELIUM LASER WITH SPHERICAL MIRRORS A66-41830

QUANTUM GENERATORS AND COHERENT LIGHT AMPLIFIERS  
JPRS-36295 N66-29984

## KOROLEV, I. U. N.

GA AS SEMICONDUCTOR QUANTUM GENERATOR HEATING  
DURING INJECTION PULSE, ANALYZING TEMPERATURE  
EFFECT ON EXTERNAL QUANTUM OUTPUT AND GENERATOR  
EFFICIENCY A66-41621

## KOROTKOVA, Z. S.

SUBMILLIMETER WAVELENGTH ELECTRONIC DEVICES,  
EXAMINING DEVELOPMENT OF LASERS AND REFLECTED WAVE  
TUBES WITH OVERLAPPING EFFECTIVE WAVE RANGE A66-38004

SUBMILLIMETER WAVELENGTH ELECTRONIC DEVICES,  
EXAMINING DEVELOPMENT OF LASERS AND REFLECTED WAVE  
TUBES WITH OVERLAPPING EFFECTIVE WAVE RANGE A67-17168

## KOROVITSYN, A. V.

OSCILLATION TYPES FOR GAS-LASER SEMICONCENTRIC  
RESONATOR A66-28160

OSCILLATION TYPES FOR GAS-LASER SEMICONCENTRIC  
RESONATOR A67-13286

## KORPEL, A.

HORIZONTAL DEFLECTION IN TV DISPLAY PRODUCED BY  
BRAGG REFLECTION OF LASER LIGHT BY ULTRASONIC  
WAVES IN WATER A66-42816

## KOSONOCKY, W. F.

LASER DIGITAL DEVICES, DISCUSSING USE AS SWITCHING  
CIRCUIT IN DIGITAL COMPUTER A67-19088

SEMICONDUCTOR LASERS FOR DIGITAL COMPUTER CIRCUITS  
N67-13063

## KOSOUROV, G. I.

LASER AS SOURCE OF OPTICAL FOURIER ANALYSIS OF  
ATOMIC STRUCTURE OF CRYSTALS A67-16921

## KOSTER, A.

PERTURBATION OF RUBY LASER BY VIBRATING ONE OF  
MIRRORS CONSTITUTING RESONANT CAVITY A66-42999

## KOSTER, G. F.

TRANSITION PROBABILITIES AND LIFETIMES IN IONIZED  
ARGON GAS LASERS A66-26207

RADIATIVE TRANSITION PROBABILITIES BETWEEN LASER  
VIBRATIONAL LEVELS OF CARBON DIOXIDE, NOTING  
RELAXATION TIME AND DIPOLE MOMENT A67-11891

## KOSTIN, N. N.

FREQUENCY SHIFT IN RESONANCE TRANSITION INDUCED IN  
POTASSIUM VAPOR BY RUBY LASER PULSE A66-25103

FREQUENCY SHIFT IN RESONANCE TRANSITION INDUCED  
IN POTASSIUM VAPOR BY RUBY LASER PULSE A66-30282

RESONANT BIREFRINGENCE IN POTASSIUM VAPOR UNDER  
INFLUENCE OF ELECTRIC FIELD OF RUBY LASER EMISSION

- A66-36066
- KOSTIN, V. V.  
LASER REGIME WITH GIANT PULSES GENERATED IN  
DYSPROSIUM DOPED CADMIUM FLUORIDE UNDER CONTINUOUS  
PUMPING BY XENON LAMPS, OBTAINING Q FACTOR  
MODULATION BY ROTATING PRISM A66-34178
- DYSPROSIUM DOPED CALCIUM FLUORIDE GIANT PULSE  
LASER WITH HIGH REPETITION RATE OBTAINED, USING  
DC PUMPING XENON LAMP A67-16674
- KOTERA, H.  
LOW THRESHOLD NEODYMIUM GLASS LASER OSCILLATOR  
WITH HIGH REPETITION A66-33325
- KOURILO, J. G.  
YTTRIUM-ALUMINUM GARNET CRYSTAL GROWTH FROM MOLTEN  
FLUX FOR LASER APPLICATION N66-34570
- KOUTSOYANNIS, S. P.  
VELOCITY DISTRIBUTION FUNCTION MEASUREMENT OF GAS  
BASED ON LASER BEAM ATTENUATION  
SUDAAR-275 N67-18270
- KOVACS, M. A.  
MOLECULAR GAS LASER Q-SWITCHING TECHNIQUES,  
DETERMINING ROTATIONAL COLLISION SECTIONS FOR  
CARBON DIOXIDE AND CROSS SECTIONS FOR VIBRATIONAL  
RELAXATION A67-16632
- KOVAL, P. M.  
RUBY LASER PUMPING THRESHOLD ENERGY, DIVERGENCE  
ANGLE AND OUTPUT POWER AS AFFECTED BY RESONATOR  
LENGTH A66-39769
- RUBY LASER PUMPING THRESHOLD ENERGY, DIVERGENCE  
ANGLE AND OUTPUT POWER AS AFFECTED BY RESONATOR  
LENGTH A67-12855
- KOVAL, P. N.  
LASER Q-FACTOR MODULATION BY SPECTRAL ABSORPTION  
FILTERS WITH INVERSE BLEACHING A66-29354
- KOVALCHUK, V. M.  
LASER LINES OF PULSED DISCHARGE IN IODINE VAPOR  
A67-10549
- LASER LINES OF PULSED DISCHARGE IN IODINE  
VAPOR A67-11057
- KOVRIGIN, A. I.  
STATISTICAL EFFECTS DURING GENERATION OF SECOND  
HARMONIC IN OPTICALLY TRANSPARENT CRYSTALS, NOTING  
COEFFICIENT OF CORRELATION BETWEEN HARMONIC AND  
FUNDAMENTAL RADIATION POWER OF SOLID STATE LASER  
A66-31167
- STATISTICAL EFFECTS DURING GENERATION OF SECOND  
HARMONIC IN OPTICALLY TRANSPARENT CRYSTALS, NOTING  
COEFFICIENT OF CORRELATION BETWEEN HARMONIC AND  
FUNDAMENTAL RADIATION POWER OF SOLID STATE LASER  
A67-12928
- KOVRYGIN, A. I.  
LIGHT FREQUENCY MULTIPLIERS FOR NONLINEAR OPTICAL  
EFFECTS AT VARIOUS WAVELENGTHS, CONSIDERING  
FOCUSING, LASER BEAM FINITE DIVERGENCE, AIR  
BREAKDOWN, STIMULATED RAMAN EMISSION, ETC  
A66-26146
- KRAMARENKO, N. L.  
EMISSION LOSSES IN SOLID STATE LASER RESONATOR  
CALCULATED FOR ND GLASS LASER A67-13133
- KRASILNIKOV, A. I.  
INDIUM ARSENIC ANTIMONIDE SINGLE CRYSTALS IN P-N  
JUNCTION LASER A66-31767
- INDIUM ARSENIC ANTIMONIDE SINGLE CRYSTALS IN P-N  
JUNCTION LASER A67-10087
- TEMPERATURE DEPENDENCE OF THRESHOLD CURRENT IN  
INJECTION LASERS IN CONTINUOUS OPERATION UNDER  
LIQUID NITROGEN COOLING A67-18788
- LASER ACTION IN ZINC SELENIDE CRYSTALS AT 4600  
ANGSTROMS PREPARED UNDER HIGH PRESSURE IN CLOSED  
CONTAINER BY GAS PHASE REACTION AND FOLLOWING
- CRYSTALLIZATION A67-20183
- KRASOVITSKII, V. B.  
CHARGED PARTICLE MOTION IN MAGNETIC FIELD UNDER  
ACTION OF LASER EMISSION A67-18787
- KRAUZMAN, M.  
RAMAN DIFFUSION SPECTRA FROM CRYSTALS EXCITED BY  
GAS LASER A66-26345
- KRAYCHENKO, V. I.  
TIME CHARACTERISTICS IN GENERATION OF GIANT LASER  
PULSE STUDIED BY CIRCUIT WITH PRISMATIC SHUTTERS  
A66-29702
- KREMENEK, C. R.  
ZERO MAGNETIC FIELD MILLIMETER MASER USING  
TRIVALENT IRON ION IN HOST CRYSTALLINE STRUCTURE  
OF RUTILE /TITANIUM DIOXIDE/ AS ACTIVE MATERIAL  
A66-29018
- KRINKOV, P. G.  
RUBY LASER WITH SCATTERING INDUCED FEEDBACK AND  
ABSENCE OF RESONANCE TYPE OSCILLATIONS A67-10740
- KRINSKY, S.  
PROPERTIES OF SELF-TRAPPED LIGHT FILAMENTS NOTING  
STIMULATED RAMAN EMISSION AND CREATION,  
CONTAINMENT AND TERMINATION MECHANISMS A67-16648
- NEW CLASS LIGHT FILAMENT IDENTIFIED IN RAMAN  
RADIATION OF INTENSE RUBY LASER BEAM  
NASA-TM-X-57831 N66-33863
- KRIUKOV, P. G.  
TIME PARAMETERS OF POWERFUL LASER MEASURED WITH  
GA AS PHOTODIODE, NOTING TIME CONSTANT AND TIME  
RESOLUTION OF PHOTODIODE A66-27750
- PROPAGATION RATE OF HIGH POWER LASER LIGHT PULSE  
IN INVERSELY POPULATED MEDIUM A66-29980
- LASER ACTION WITH NONRESONANT FEEDBACK USING HIGH  
GAIN RUBY CRYSTALS A66-30297
- NONLINEAR AMPLIFICATION OF LIGHT PULSE PASSING  
THROUGH LASER OPERATING AT SATURATION REGIME  
A66-39542
- GIANT PULSE GENERATION RANGE IN TRANSVERSE  
DIRECTION AFTER Q-SWITCHING IN RUBY LASER,  
EXAMINING RESONATOR PROPERTIES A66-42516
- SHORT PULSE Q-SWITCHED LASER WITH VARIABLE PULSE  
LENGTH A67-16641
- RUBY LASER WITH NONRESONANT FEEDBACK DUE TO  
RADIATION SCATTERING, SHOWING USE AS OPTICAL  
FREQUENCY STANDARD A67-16642
- DYNAMICS OF NARROWING EFFECT OF SURFACE AND  
SPATIAL DISPERSING AGENTS ON RADIATION LINE OF  
RUBY LASER WITH NONRESONANCE FEEDBACK A67-18797
- KRIUKOVA, I. V.  
MINIMUM SPECTRAL LINE WIDTH, THRESHOLD CURRENT  
DENSITY, RADIATION-PEAK DISPLACEMENT AND POSSIBLE  
RECOMBINATION MECHANISM FOR GA SB LASER DIODE P-N  
JUNCTIONS IN COHERENT RADIATION A66-31764
- MINIMUM SPECTRAL LINE WIDTH, THRESHOLD CURRENT  
DENSITY, RADIATION-PEAK DISPLACEMENT AND POSSIBLE  
RECOMBINATION MECHANISM FOR GA SB LASER DIODE P-N  
JUNCTIONS IN COHERENT RADIATION A67-10085
- KRIVOSHCHIEV, G. V.  
RUBY LASER-INDUCED EFFECT OF PULSED PRESSURE ON  
KDP CRYSTAL SURFACE AND THERMAL BULK EFFECT ON  
EXCITATION OF ULTRASONIC OSCILLATION IN CRYSTAL  
A66-40318
- RUBY LASER FREQUENCY CONVERSION TECHNIQUE BY LASER  
BEAM SCATTERING AND MIXING OF COMBINED FREQUENCIES  
A67-13094

- KROENERT, R.  
RELATIONSHIP BETWEEN AMPLIFICATION, BANDWIDTH AND  
NOISE TEMPERATURE IN MASER AMPLIFIER, CONSIDERING  
PARAMAGNETIC PERMEABILITY AND Q-FACTOR  
A66-29051
- KROHS, A.  
PHOTOELECTRONIC COMPONENTS AND ELECTRONIC  
MEASUREMENT TECHNIQUES IN RECEPTION AND  
DEMODULATION OF HF MODULATED LASER BEAMS  
A67-10300
- KROKHIN, O. N.  
SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-  
PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION  
A66-27187
- EXCITATION OF AXIAL OSCILLATION MODES IN  
SEMICONDUCTOR LASERS ANALYZED, BASED ON RATE  
EQUATIONS FOR CHEMICAL POTENTIALS OF CARRIERS AND  
NUMBER OF PHOTONS  
A66-37687
- SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-  
PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION  
A66-43085
- HEATING AND SCATTERING OF PLASMA PRODUCED BY  
GIANT LASER PULSE FOCUSED ON SOLID TARGET  
A67-14194
- GAS DYNAMIC EQUATIONS FOR DETERMINATION OF  
HEATING, VAPORIZATION AND EXPANSION OF SUBSTANCE  
DUE TO Q-SWITCHED LASER RADIATED COLLIMATES ONTO  
SURFACE OF SOLIDS  
A67-16652
- SEMICONDUCTOR LASERS NOTING STRONG FIELD BEHAVIOR  
AND ABSORPTION COEFFICIENT FOR SATURATION  
A67-16672
- LASER RADIATION EFFECT ON HEATING PROCESS AND GAS  
DYNAMIC MOTION OF FINITE TRANSPARENT GAS AND  
MOTIONLESS COLD GAS AT VACUUM INTERFACE  
A67-17008
- KROL, V. M.  
LASER RADIATION EFFECT ON HEATING PROCESS AND GAS  
DYNAMIC MOTION OF FINITE TRANSPARENT GAS AND  
MOTIONLESS COLD GAS AT VACUUM INTERFACE  
A67-17008
- KRONQUIST, R. L.  
CALCULATIONS AND EXPERIMENTS TO DETERMINE ION WAVE  
INSTABILITY IN STEADY STATE DISCHARGE, LASER  
BREAKDOWN IN PLASMA, AND MICROWAVE SCATTERING  
FROM STANDING PLASMA WAVES  
N67-14628
- KRSEK, J.  
TUNING OF GAS LASER RESONATOR  
A67-19505
- KRUPNOV, A. F.  
BEAM MASER EXCITATION PARAMETER CALCULATIONS  
INCLUDING COLLISION IN BEAM EFFECTS AND COMPARISON  
WITH MOLECULAR FORMALDEHYDE  
A66-26054
- MOLECULE REORIENTATION AND TRANSITION PROBABILITY  
IN MOLECULAR BEAM MASER USING FORMALDEHYDE  
A66-39662
- KRUZHALOV, S. V.  
NEODYMIUM GLASS LASER TIME CHARACTERISTICS AND  
SPECTRAL CHANGES DURING CONVERSION TO TRAVELING  
WAVE LASER  
A67-18782
- KRUZHILIN, I. I.  
LASER PRODUCING TWO OR THREE LIGHT PULSES IN  
SEQUENCE WITH INTERVAL BETWEEN PULSES MECHANICALLY  
CONTROLLED BY OPTICAL WEDGE INSERTED INTO  
RESONATOR  
A66-25322
- POLARIZING PROPERTIES OF LASER REFLECTOR  
CONSISTING OF TWO IDENTICAL RECTANGULAR PRISMS  
A66-31803
- POLARIZING PROPERTIES OF LASER REFLECTOR  
CONSISTING OF TWO IDENTICAL RECTANGULAR PRISMS  
A66-39105
- LASER PRODUCING TWO OR THREE LIGHT PULSES IN  
SEQUENCE WITH INTERVAL BETWEEN PULSES MECHANICALLY  
CONTROLLED BY OPTICAL WEDGE INSERTED INTO  
RESONATOR  
A67-10161
- KRYLOV, I. K.  
TEMPORAL-SPATIAL VARIATION OF CROSS SECTIONAL FLUX  
DISTRIBUTION OF STIMULATED EMISSION FROM NO GLASS  
PULSED LASER  
A67-14280
- KRYUKOV, P. G.  
DESCRIPTION OF RUBY LASER USED IN OPTICAL LOCATION  
OF MOON  
NASA-TT-F-8866  
N66-29428
- KSANDER, Y.  
SOVIET QUANTUM ELECTRONICS RESEARCH  
ATD-66-97  
N67-14312
- KUBO, U.  
PLASMA FLUCTUATION EFFECT ON GAS LASER NOISE,  
NOTING RELATION BETWEEN MODULATION AMPLITUDE OF  
LIGHT OUTPUT AND FREQUENCY NOISE AND OSCILLATION  
SPECTRUM  
A66-41294
- RATE EQUATIONS FOR GAS DISCHARGE MODULATION OF  
HE- NE LASER  
A67-19492
- KUCHUBERIA, I. KH.  
MEASURING DEVICE FOR PULSED LASER OUTPUT POWER  
USING BOLTOMETER, AMPLIFIER AND OSCILLOSCOPE  
A66-29701
- KUDRIASHEV, L. I.  
TEMPERATURE FIELD OF ACTIVE MEDIUM OF PULSED LASER  
USING VARIATIONAL METHODS, CONSIDERING TWO  
APPROXIMATE SOLUTIONS  
A67-16935
- KUDRIASHEVA, N. L.  
TEMPERATURE FIELD OF ACTIVE MEDIUM OF PULSED LASER  
USING VARIATIONAL METHODS, CONSIDERING TWO  
APPROXIMATE SOLUTIONS  
A67-16935
- KUHN, F. F.  
AUTOMATIC LASER BEAM DETECTOR AND INSTANTANEOUS  
TRANSVERSE ELECTROMAGNETIC MODE ANALYSIS OF  
HELIUM-NEODYMIUM LASER  
N67-16952
- KULEVSKII, L. A.  
CD S SINGLE CRYSTAL OPTICAL GENERATOR DURING  
EXCITATION BY RUBY LASER, DISCUSSING TWO-PHOTON  
ABSORPTION COEFFICIENT AT 300 DEGREES K FOR  
RADIATION FLUX DENSITIES  
A66-27576
- LASER REGIME WITH GIANT PULSES GENERATED IN  
DYSPROSIUM DOPED CADMIUM FLUORIDE UNDER CONTINUOUS  
PUMPING BY XENON LAMPS, OBTAINING Q FACTOR  
MODULATION BY ROTATING PRISM  
A66-34178
- OSCILLATION IN CD S CRYSTAL BY RUBY LASER  
INDUCED TWO-PHOTON EXCITATION, NOTING  
PROPORTIONALITY OF ABSORPTION COEFFICIENT TO LIGHT  
BEAM INTENSITY  
A67-16667
- DYSPROSIUM DOPED CALCIUM FLUORIDE GIANT PULSE  
LASER WITH HIGH REPETITION RATE OBTAINED, USING  
DC PUMPING XENON LAMP  
A67-16674
- KULIKOV, O. F.  
LASER BEAM EFFECT ON BENZENE AND OTHER ORGANIC  
COMPOUNDS, NOTING FORMATION OF DARK READILY  
COAGULATING DEPOSIT  
A67-17028
- KULISH, M. R.  
LASER Q-FACTOR MODULATION BY SPECTRAL ABSORPTION  
FILTERS WITH INVERSE BLEACHING  
A66-29354
- RUBY LASER PUMPING THRESHOLD ENERGY, DIVERGENCE  
ANGLE AND OUTPUT POWER AS AFFECTED BY RESONATOR  
LENGTH  
A66-39769
- RUBY LASER PUMPING THRESHOLD ENERGY, DIVERGENCE  
ANGLE AND OUTPUT POWER AS AFFECTED BY RESONATOR  
LENGTH  
A67-12855
- POSSIBLE OSCILLATION MODES IN CYLINDRICAL SOLID  
STATE LASER AND DEPENDENCE OF PUMPING THRESHOLD,  
OUTPUT POWER AND DIVERGENCE ANGLE ON RESONATOR  
LENGTH  
A67-13129

KULIUPIN, I. A.  
CONTINUOUS HELIUM-NEON LASER USED TO OBTAIN  
SHORT INTENSE LIGHT PULSES AND TO STUDY KINETICS  
OF AUTOPHOTOELECTRONIC EMISSION OF HIGH  
RESISTIVITY SILICON A67-13142

KUMAGAI, N.  
LASER AMPLIFIER THEORY USING FABRY-PEROT  
INTERFEROMETER AND LAPLACE TRANSFORM FOR  
OBTAINING TRANSIENT SOLUTIONS IN ADDITION TO  
STEADY STATE SOLUTIONS A66-39224

REFLECTING MIRRORS IN LASER OSCILLATORS TREATED AS  
REFLECTING ELEMENTS AND TRANSDUCERS FOR COUPLING  
POWER FROM OSCILLATOR TO EXTERNAL SPACE A66-40184

KURBASOV, V. V.  
MEASUREMENT OF DISTANCE TO MOON BY OPTICAL  
RADAR, DISCUSSING RUBY LASER/PHOTOMULTIPLIER  
APPARATUS AND PROCEDURE A66-30291

LUNAR FIGURE AND ORBIT PARAMETERS MEASURED BY  
OPTICAL LOCATION METHOD A66-35285

DESCRIPTION OF RUBY LASER USED IN OPTICAL LOCATION  
OF MOON  
NASA-TT-F-8866 N66-29428

KURIATOV, V. N.  
RESONATOR GEOMETRY AND MIRROR POSITIONS AND EFFECT  
ON RADIATION OUTPUT IN HELIUM-NEON LASER A66-29201

RESONATOR GEOMETRY AND MIRROR POSITIONS AND EFFECT  
ON RADIATION OUTPUT IN HELIUM-NEON LASER A66-33050

WAVE SYNCHRONIZATION IN GAS LASER WITH RING  
RESONATOR CAVITY A66-39301

KURILKO, V. I.  
CHARGED PARTICLE MOTION IN MAGNETIC FIELD UNDER  
ACTION OF LASER EMISSION A67-18787

KURNIT, N. A.  
PHOTON ECHO, OPTICAL ANALOG OF SPIN ECHO, IN RUBY  
CRYSTALS, USING RUBY LASER AS EXCITATION SOURCE A66-26170

KURNOSOV, V. D.  
TIME STRUCTURE AND AMPLITUDE SELF-MODULATION OF  
EMISSION FROM GA AS INJECTION LASER OBSERVED,  
USING ELECTRON-OPTICAL CONVERTER A67-17756

KURTZ, R. L.  
AMPLITUDE AND FREQUENCY MEASUREMENT OF RANDOM  
POSITION FLUCTUATION OF STATIONARY LASER OPTICAL  
SOURCE DUE TO ATMOSPHERIC TURBULENCE  
NASA-TN-D-3439 N66-25558

KUSHIDA, T.  
EXPERIMENTAL EXCITED STATE BAND LOCATIONS AND  
INTENSITIES IN ABSORPTION SPECTRUM OF ELECTRON  
TRANSITIONS IN OPTICALLY PUMPED RUBY LASER A66-39569

THEORETICAL EXCITED STATE ABSORPTION SPECTRUM OF  
ELECTRON TRANSITIONS IN OPTICALLY PUMPED RUBY  
LASER A66-39570

OPTICALLY PUMPED RUBY NOTING ABSORPTION AND  
EMISSION SPECTRUM, TRANSITION STAGES AND PHONON  
TERMINATED AMPLIFICATION A67-16658

KUZNETSOV, A. A.  
AXIAL MAGNETIC FIELD EFFECT ON NE-HE LASER POWER  
OUTPUT OPERATING IN REGIME OF SIMULTANEOUS  
GENERATION OF 3.39 AND 0.6328 MICRON LINES A67-19601

KUZNETSOV, V. S.  
MULTIMODALITY OF GAS LASER IN RESONATOR WITH  
ONE DIRECTION TRAVELING WAVE PROPAGATION N67-11315

KWOK, M. A.  
VELOCITY DISTRIBUTION FUNCTION MEASUREMENT OF GAS

BASED ON LASER BEAM ATTENUATION  
SUDAAR-275 N67-18270

## L

LA CONTI, A. B.  
LASER MICROPROBE AS EXCITATION SOURCE FOR EMISSION  
SPECTROCHEMICAL ANALYSIS  
AFCRL-65-855/I/ N66-29249

LA GRONE, A. H.  
GIANT PULSE LASER WITH HIGH REPETITION RATE FOR  
OPTICAL RANGING SYSTEMS  
NSF-P-9 N66-36248

LA VIER, E. C.  
COHERENT OPTICAL SIGNAL PROCESSORS N67-13073

LABORGE, S.  
ABRUPT TRANSMISSION CHANGE DURING RUBY LASER  
EMISSION RESULTING FROM PUMPING WITH XENON FLASH  
LAMP A67-15649

LABUDA, E. F.  
ELECTRON IMPACT EXCITATION MECHANISM OF ARGON-ION  
CONTINUOUS AND LONG PULSE LASERS A66-26206

LAINE, D. C.  
OSCILLATION AMPLITUDE MODULATION IN AMMONIA BEAM  
MASER OSCILLATOR WITH SINGLE CAVITY FOLLOWED BY  
TWO CAVITIES IN CASCADE A67-16636

LALLEMAND, P.  
COUPLED WAVE FORMALISM, GIVING UNIFIED DESCRIPTION  
OF PARAMETRIC DOWN CONVERSION OF LIGHT, STIMULATED  
BRILLOUIN AND RAMAN EFFECTS, ETC, STRESSING  
EXPONENTIAL CHARACTER OF GAIN A66-26156

LAMB, W. E.  
QUANTUM THEORY OF LASER HAVING ONLY SINGLE-MODE  
OSCILLATION AND IGNORING ATOMIC MOTION AND SPATIAL  
VARIATIONS IN CAVITY MODE A66-29117

LAMB, W. E., JR.  
PRESSURE EFFECTS IN FABRY-PEROT LOSSY-CAVITY GAS  
LASER OUTPUT A66-26199

LAMBERTY, D. R.  
OPTICAL COMMUNICATION FOR MARS EXPLORATION WITH  
OUTLINE OF LASER MODULATORS AND ANTENNAS A66-25251

LAMBROPOULOS, P.  
HYPERSONIC EXCITATIONS DUE TO BRILLOUIN  
SCATTERING FOR CASE WITH STOKES FEEDBACK,  
DERIVING QUANTUM EQUATION OF MOTION FOR CREATION  
OF LASER AND STOKES MODES AND COUPLED ACOUSTIC  
MODE A67-16683

LAMORTE, M. F.  
THRESHOLD CURRENT DENSITY DEPENDENCY ON PHOTON  
ENERGY IN GALLIUM ARSENIDE LASER DIODES A67-13480

LAMPIS, G.  
CALCULATIONS AND EXPERIMENTS TO DETERMINE ION WAVE  
INSTABILITY IN STEADY STATE DISCHARGE, LASER  
BREAKDOWN IN PLASMA, AND MICROWAVE SCATTERING  
FROM STANDING PLASMA WAVES N67-14628

LANDA, P. S.  
WAVE SYNCHRONIZATION IN GAS LASER WITH RING  
RESONATOR CAVITY A66-39301

LANDRY, M. J.  
HOLOGRAM COPYING METHOD USING GAS LASER AS LIGHT  
SOURCE A67-12513

LANG, K. T.  
SENSITIVITY AND TRACKING CAPABILITIES OF PRECISION  
LASER AUTOMATIC TRACKING SYSTEM A66-25984

LANGER, P.  
ELECTRON-ION EMISSION PATTERN DISTRIBUTION  
OBTAINED BY PULSED LASER FOCUSING ON SOLID TARGET  
A66-33256

## LANGFORD, R. C.

INERTIAL SENSORS, DISCUSSING MAGNETIC RESONANCE AND SUPERCONDUCTOR GYROSCOPES, RING LASERS, FLUID DYNAMICAL DEVICES, ELECTROSTATIC GYROSCOPES, ETC  
A67-16517

## LARGE, L. N.

DOPING OF SEMICONDUCTORS BY ION BOMBARDMENT - MACHINING BY LASER BEAM - OSCILLATIONS AND CIRCUIT BEHAVIOR OF GUNN DIODES  
N66-35029

## LASSER, M. E.

LASER DETECTION OF COHERENT LIGHT AND SUPERHETERODYNE AND NONLINEAR PARAMETRIC STUDIES IN OPTICAL SPECTRUM  
A66-27821

## LASTOVKA, J. B.

VELOCITY AND LIFETIME OF MICROWAVE THERMAL PHONONS IN LIQUIDS AND SOLIDS DETERMINED BY SPECTRUM OF LIGHT SCATTERING FROM LASER ILLUMINATED SAMPLE  
A66-26166

## LAUDON, H.

OPTICAL INSTRUMENTATION RADAR FOR REAL-TIME POSITIONAL DATA ON HIGH-SPEED COOPERATIVE TARGETS  
A66-25654

## LAURANT, J.-M.

OPTICAL EXCITATION IN INDIUM ARSENIDE AND GALLIUM ANTIMONIDE YIELDING LASER RADIATION  
A66-25438

## LAURES, P.

IR LASER RADIATION WITH POWER OF 5.7 WATTS IN VICINITY OF 10.69 MU IN SEALED TUBE CONTAINING PURE CARBON DIOXIDE EXCITED BY AC OR DC CURRENT  
A66-25410

FREQUENCY STABILIZATION OF GAS LASER BY SERVOMECHANISM AND LAMB DIP METHOD  
A66-33252

## LAVRUSHIN, B. M.

LASER BASED ON EXCITATION OF GALLIUM PHOSPHORUS ARSENIDE SOLID SOLUTION BY BEAM OF FAST ELECTRONS  
A66-33304

GALLIUM ARSENIDE LASER EXCITATION BY FAST ELECTRONS  
A66-35760

PERFORMANCE OF GA AS SEMICONDUCTOR LASER WITH RESONATOR, NOTING DEPENDENCE OF FORBIDDEN ZONE WIDTH AND ABSORPTION COEFFICIENT ON FREE CARRIER CONCENTRATION AND INCIDENT PHOTON ENERGY  
A66-38955

LASER BASED ON EXCITATION OF GALLIUM PHOSPHORUS ARSENIDE SOLID SOLUTION BY BEAM OF FAST ELECTRONS  
A67-11824

PERFORMANCE OF GA AS SEMICONDUCTOR LASER WITH RESONATOR, NOTING DEPENDENCE OF FORBIDDEN ZONE WIDTH AND ABSORPTION COEFFICIENT ON FREE CARRIER CONCENTRATION AND INCIDENT PHOTON ENERGY  
A67-15759

SEMICONDUCTOR GALLIUM-ARSENIDE LASER WITH FLAT RESONATOR  
N66-36291

## LAX, B.

MULTIPLE CYCLOTRON RESONANCE ABSORPTION LINES IN DEGENERATE VALENCE BANDS OF GE SEMICONDUCTOR STUDIED WITH FAR IR LASER SUBMILLIMETER SPECTROMETER  
A66-42545

HIGH MAGNETIC FIELD EFFECT ON INTERBAND SEMICONDUCTOR LASER, PARTICULARLY ELECTROMAGNETIC MODES AND COUPLING AND THRESHOLD CURRENT CONDITIONS  
A67-16673

## LAX, M.

NONLINEAR QUANTUM MECHANICAL ANALYSIS OF LASER STEADY MOTION, STABILITY UNDER DEVIATIONS AND NOISE EFFECT ON LINE WIDTH AND INTENSITY FLUCTUATIONS  
A66-26213

## LAYDEN, G. K.

FLUORESCENT LIFETIMES OF NEODYMIUM, YTTERBIUM AND

SAMARIUM INCORPORATED IN ORDERED PEROVSKITE-TYPE COMPOUNDS DETERMINED, NOTING CRYSTAL STRUCTURE POTENTIAL FOR LASER EMISSION  
A66-27976

## LE MEZEC, J.

LASER LIGHT MODULATION BY POCKELS OR KERR EFFECT FOR APPLICATION TO TELECOMMUNICATIONS SYSTEM, EXAMINING ELECTRICAL BIREFRINGENCE MODULATION  
A66-36262

## LEA, D. A.

LASER RADAR RETURNS FROM LOWER TROPOSPHERE COMPARED WITH VERTICAL OZONE DISTRIBUTIONS INDICATE INVERSE RELATIONSHIP  
A67-14676

## LEBEDEV, I. V.

REGENERATIVE HELIUM-NEON LASER WITH AMPLIFICATION COEFFICIENT OF 1000  
A66-29352

REGENERATIVE HELIUM-NEON LASER WITH AMPLIFICATION COEFFICIENT OF 1000  
A66-37357

## LEBEDEV, O. L.

Q-FACTOR MODULATION OF RUBY-LASER RESONATOR BY PHTHALOCYANINE SERIES  
A66-29353

G-FACTOR MODULATION OF RUBY-LASER RESONATOR BY PHTHALOCYANINE SERIES  
A66-37358

## LEBEDEV, V. I.

LOSSES IN RUBY LASER DETERMINED FROM DATA ON VARIATIONS IN BEAM DIVERGENCE ANGLE AND VARIATIONS IN LASING SPOT DIAMETER  
A67-12742

PROBABILITY METHOD OF DETERMINING ENERGY LOSSES IN RUBY LASER WITH MISALIGNED RESONATORS  
N67-19235

## LEBEDEVA, V. V.

REGENERATIVE HELIUM-NEON LASER WITH AMPLIFICATION COEFFICIENT OF 1000  
A66-29352

REGENERATIVE HELIUM-NEON LASER WITH AMPLIFICATION COEFFICIENT OF 1000  
A66-37357

## LEBEDINSKAIA, Z. T.

OSCILLATION TYPES FOR GAS-LASER SEMICONCENTRIC RESONATOR  
A66-28160

OSCILLATION TYPES FOR GAS-LASER SEMICONCENTRIC RESONATOR  
A67-13286

## LEBLANC, M.

INTENSE PULSE GENERATION AT 5300 ANGSTROMS BY FREQUENCY DOUBLING IN Q-SWITCHED AND GLASS LASER AND POSSIBILITY OF GENERATING PARTICULAR HARMONICS  
A67-10759

## LEBLOCH, H.

SEMICONDUCTOR LASERS AND FAST IR DETECTORS, DISCUSSING IN AS, IN SB AND THREE TYPES OF MERCURY CADMIUM TELLURIDE DETECTORS  
A67-16668

## LEE, P. H.

GAS LASER OUTPUT WAVELENGTH STABILIZATION BY USE OF EXTERNAL PASSIVE OPTICAL INTERFEROMETER  
A66-28835

SATURATION INDUCED OPTICAL NONRECIPROCITY IN HE- NE RING LASER PLASMA, ELIMINATING FREQUENCY LOCKING BY USING FARADAY EFFECT  
A66-42552

## LEE, T. C.

INTRACAVITY TIME-VARYING PERTURBATION OF LOSSES IN GAS LASER USING DIAMAGNETIC FARADAY EFFECT IN GLASSES ANALYZED IN CONNECTION WITH OUTPUT INTENSITY  
A67-16646

## LEGAY, F.

PHYSICAL MECHANISM OF MOLECULAR LASERS AND VIBRATIONAL ROTATION RELATION  
A66-33246

## LEHR, C. G.

RUBY LASER ENERGY REFLECTED OFF EXPLORER XXII SATELLITE  
A66-27054

SATELLITE RANGE MEASUREMENTS USING LASER IN



- CONJUNCTION WITH PHOTOELECTRIC RECEIVER AND  
BAKER- NUNN CAMERA A66-29998
- PULSED RUBY LASER PHOTOELECTRIC RECEIVER  
EXPERIMENTS DETERMINING SATELLITE ORBITS,  
SUPPLEMENTING BAKER- NUNN CAMERA NETWORK A66-42547
- PHOTOGRAPHIC MEASUREMENT OF ENERGY DISTRIBUTION  
IN BEAM OF Q-SWITCHED RUBY LASER  
NASA-CR-75102 N66-26252
- SATELLITE TRACKING WITH LASER - RANGE EQUATION,  
DETECTION AT NIGHT AND IN DAYLIGHT,  
NONCOOPERATIVE SATELLITES, AND COMPARISON OF  
OF LASER AND RADAR SYSTEMS NASA-CR-76902 N66-32684
- RANGE MEASUREMENTS OF GEOS-I AND BE-C SATELLITES  
WITH RUBY LASER NASA-CR-77292 N66-34634
- LEIGHTON, R. L.  
LASERS APPLIED TO PHOTO-OPTICAL INSTRUMENTATION  
PROBLEMS, DETAILING SCHLIEREN SYSTEMS,  
INTERFEROMETRY, HIGH SPEED STREAK PHOTOGRAPHY AND  
TRANSISSOMETER A67-12243
- LEITH, E. N.  
HOLOGRAPHIC METHODS, AND APPLICATIONS BASED ON  
LASERS AS COHERENT LIGHT SOURCE N67-17791
- LEJA, J.  
QUALITATIVE RESULTS ON TRANSPORT MECHANISMS  
AROUND DROPPING MERCURY ELECTRODE, USING LONG PATH  
LASER INTERFEROMETRY A66-33924
- LEMPICKI, A.  
ORGANIC LASER SYSTEMS INCLUDING LUMINESCENCE FOR  
ACHIEVING LASER ACTION, FLUORESCENT AND  
PHOSPHORESCENT SYSTEMS AND CHEMISTRY AND  
SPECTROSCOPIC PROPERTIES OF RARE EARTH CHELATES A66-36970
- PERFORMANCE CHARACTERISTICS OF ROOM TEMPERATURE  
LIQUID LASER, USING TRIVALENT ION NEODYMIUM-DOPED  
SELENIUM OXYCHLORIDE A66-39111
- PHYSICAL PROPERTIES AND OPERATING CHARACTERISTICS  
OF EUROPIUM AND RARE EARTH CHELATE LASERS  
TR-66-052.13 N67-12533
- LENGYEL, B. A.  
MONOGRAPH ON LASERS INCLUDING GAS LASERS, RUBY  
LASERS, GIANT-PULSE TECHNIQUES, OSCILLATION MODES,  
ETC A66-26961
- MASERS AND LASERS FROM EINSTEIN DISCOVERY OF  
STIMULATED EMISSION TO PRESENT A67-10503
- LEONARD, D. A.  
PULSED NITROGEN LASER DELIVERING HIGH AVERAGE  
POWER WITHOUT COMPLICATIONS OF CONVENTIONAL Q-  
SWITCHING A66-38266
- LEONOV, R. K.  
PERFORMANCE CHARACTERISTICS FOR PULSE TYPE AR  
LASER WITH EXTERNAL INTERFERENTIAL SYSTEM OF  
QUASI-CONFOCAL SPHERICAL MIRRORS A66-41452
- PERFORMANCE CHARACTERISTICS FOR PULSE TYPE AR  
LASER WITH EXTERNAL INTERFERENTIAL SYSTEM OF  
QUASI-CONFOCAL SPHERICAL MIRRORS A67-14188
- LEONTOVICH, A. M.  
DYNAMICS OF FIELD AND GENERATION FREQUENCIES IN  
GIANT PULSE OF RUBY LASER WITH PASSIVE SHUTTER,  
USING SOLUTION OF CRYPTOCYANINE IN ETHANOL, NOTING  
MIRROR REFLECTION COEFFICIENT A66-29727
- LETOKHOV, V. S.  
LIGHT PULSE SHAPE VARIATION OF LASER WITH  
MODULATED Q-FACTOR DURING NONLINEAR AMPLIFICATION  
A66-27183
- COUPLING AND SYNCHRONIZATION OF LASERS, NOTING
- FIELD AMPLITUDES, DELAYED INTERACTION AND  
DIELECTRIC CONSTANT DISPERSION A66-29885
- PROPAGATION RATE OF HIGH POWER LASER LIGHT PULSE  
IN INVERSELY POPULATED MEDIUM A66-29980
- LASER ACTION WITH NONRESONANT FEEDBACK USING HIGH  
GAIN RUBY CRYSTALS A66-30297
- GIANT COHERENT LIGHT PULSE GENERATION BY Q-  
FACTOR-MODULATED LASER A66-31183
- NONLINEAR AMPLIFICATION OF LIGHT PULSE PASSING  
THROUGH LASER OPERATING AT SATURATION REGIME A66-39542
- GIANT PULSE GENERATION RANGE IN TRANSVERSE  
DIRECTION AFTER Q-SWITCHING IN RUBY LASER,  
EXAMINING RESONATOR PROPERTIES A66-42516
- LIGHT PULSE SHAPE VARIATION OF LASER WITH  
MODULATED Q-FACTOR DURING NONLINEAR AMPLIFICATION  
A66-42727
- RADIATION OF GIANT PULSES OF SUPERLUMINESCENCE BY  
HIGHLY EXCITED ACTIVE MEDIUM OF ND GLASS WITH  
RAPID CUT-IN OF AMPLIFICATION A66-42755
- RUBY LASER WITH SCATTERING INDUCED FEEDBACK AND  
ABSENCE OF RESONANCE TYPE OSCILLATIONS A67-10740
- RADIATION OF GIANT PULSES OF SUPERLUMINESCENCE BY  
HIGHLY EXCITED ACTIVE MEDIUM OF ND GLASS WITH  
RAPID CUT-IN OF AMPLIFICATION A67-10837
- GIANT COHERENT LIGHT PULSE GENERATION BY Q-FACTOR  
MODULATED LASER A67-12941
- SHORT PULSE Q-SWITCHED LASER WITH VARIABLE PULSE  
LENGTH A67-16641
- RUBY LASER WITH NONRESONANT FEEDBACK DUE TO  
RADIATION SCATTERING, SHOWING USE AS OPTICAL  
FREQUENCY STANDARD A67-16642
- DYNAMICS OF NARROWING EFFECT OF SURFACE AND  
SPATIAL DISPERSING AGENTS ON RADIATION LINE OF  
RUBY LASER WITH NONRESONANCE FEEDBACK A67-18797
- LEVINE, L. P.  
PARTICLE EMISSION FROM SURFACE INTERACTING WITH  
LASER BEAM A67-12180
- POSITIVE ION EMISSION FROM TUNGSTEN SURFACES LASER  
IRRADIATED STUDIED, USING TIME-OF-FLIGHT  
SPECTROMETER A67-16651
- INVESTIGATIONS OF HIGH POWER LASER RADIATION  
INTERACTION WITH SURFACES USING QUADRUPOLE AND  
TIME-OF-FLIGHT MASS SPECTROMETERS  
AD-636680 N66-38247
- LEVY, R.  
LUMINESCENCE SPECTRUM OF CU CL AT LOW  
TEMPERATURES EXCITED BY DOUBLE PHOTON ABSORPTION  
FROM HIGH INTENSITY LASER BEAM A67-17822
- LEWIS, R. D.  
LASER DOPPLER VELOCIMETER FOR MEASURING LOCALIZED  
FLOW VELOCITIES IN LIQUIDS A66-27053
- LASER DOPPLER VELOCIMETER FOR GAS AND LIQUID FLOW  
VELOCITY MEASUREMENT A66-42557
- LI, T.  
LASER BEAMS AND RESONATORS, DISCUSSING BEAM  
PROPAGATION IN FREE SPACE, GEOMETRICAL OPTICS  
APPLICATION AND RESONATOR MODES IN VIEW OF  
APERTURE DIFFRACTION EFFECTS A66-42806
- LIBBY, W. F.  
PHYSICS LECTURE SUMMARIES INCLUDING LASER BEAMS,  
ELECTRON SCATTERING, PARAMAGNETIC RESONANCE,  
PARTICLE ABSORPTION, CHROMOSOMES, AND RELATIVITY  
ISS-66/19 N66-35043

- LIBERMAN, A. L.**  
LASER BEAM EFFECT ON BENZENE AND OTHER ORGANIC COMPOUNDS, NOTING FORMATION OF DARK READILY COAGULATING DEPOSIT A67-17028
- LIBERMAN, I.**  
PULSED ARC XENON DISCHARGES USED FOR OPTICAL PUMPING OF HIGH ENERGY LASERS AD-632892 N66-31537
- LIBIN, IU. V.**  
VOLUME DENSITY OF HEAT SOURCES IN RUBY LASER ROD BY NUMERICAL INTEGRATION OF PUMPING AND ABSORPTION SPECTRA A67-13117
- LIBIN, YU. V.**  
FLUX VELOCITY, CRYSTAL QUALITY AND DIAMETER, DISTRIBUTION OF CHROMIUM IONS, AND OTHER FACTORS CONSIDERED IN DESIGN OF RUBY LASER OPTICAL GENERATOR N66-37713
- LIDOV, L. D.**  
VOLT-AMPERE CHARACTERISTICS AND OTHER PROPERTIES OF GA AS LASERS WITH TELLURIUM AND ZN-DOPED EPITAXIAL P-N JUNCTION A67-10080
- CONTINUOUS COHERENT RADIATION OF GA AS SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT AMBIENT TEMPERATURE OF 77 DEGREES K A67-10548
- CONTINUOUS COHERENT RADIATION OF GA AS SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT AMBIENT TEMPERATURE OF 77 DEGREES K A67-11056
- LIDE, D. R., JR.**  
STIMULATED EMISSION IN TRIPLET SYSTEM OF NITROGEN MOLECULE PRODUCED BY PULSED LASER DISCHARGE, IDENTIFYING LINES AND INTERPRETING INTENSITY DISTRIBUTION IN ROTATIONAL BAND SPECTRUM A67-16785
- LIGDA, M. G. H.**  
ATMOSPHERIC OBSERVATION WITH ADVANCED LIGHT RADAR, NOTING EQUIPMENT CHARACTERISTICS, MOLECULAR SCATTERING MECHANISM, ETC A66-26133
- CIRRUS CLOUD COVER OBSERVATION CAPABILITY AND PERFORMANCE SPECIFICATIONS FOR METEOROLOGICAL SATELLITE LIDAR NASA-CR-76087 N66-29977
- DETECTION OF CEMENT DUST CLOUDS WITH PULSED RUBY LIDAR UCRL-13204 N66-32847
- LIKHACHEV, V. A.**  
DISINTEGRATION OF ALKALI HALIDE SINGLE CRYSTALS, POLYMERS AND GLASSES UNDER LASER RADIATION, NOTING PARAMETERS OF DISINTEGRATION REGION MAGNITUDE A66-34681
- LASER BEAM EFFECT ON HYDRODYNAMIC BEARINGS, DISCUSSING MICROCRACKS AND CRITICAL ENERGY, EXPLAINING BREAKDOWNS A66-41409
- LI F SINGLE CRYSTAL DESTRUCTION AS FUNCTION OF LASER BEAM ENERGY, EXAMINING DISLOCATION PATTERN ARISING FROM CRACK PROPAGATION A67-10071
- POLYMETHYLMETHACRYLATE AND POLYSTYRENE EXPOSURE TO RUBY AND NEODYMIUM-GLASS LASER RADIATION, NOTING APPEARANCE OF EPR A67-10075
- DISINTEGRATION OF ALKALI HALIDE SINGLE CRYSTALS, POLYMERS AND GLASSES UNDER LASER RADIATION, NOTING PARAMETERS OF DISINTEGRATION REGION MAGNITUDE A67-14367
- KINETICS OF FORMATION AND HEALING OF DAMAGE CAUSED BY LASER PULSE IN LITHIUM FLUORIDE SINGLE CRYSTALS A67-17057
- LINZ, A.**  
ABSORPTION BEHAVIOR OF OPTICALLY PUMPED RUBY ROD, NOTING AMPLIFICATION AT ROOM TEMPERATURE AND ABSORPTION AT CRYOGENIC TEMPERATURE A66-26174
- FERROELECTRIC MATERIALS FOR LIGAND FIELD MASER IN MILLIMETER RANGE - LIGAND FIELD NEAR GROUND STATE CROSSEOVERS MEASURED BY OPTICAL AND MICROWAVE SPECTROSCOPY MC-64-102-R2 N66-39741
- LIPSETT, M. S.**  
GAS LASER OUTPUT WAVELENGTH STABILIZATION BY USE OF EXTERNAL PASSIVE OPTICAL INTERFEROMETER A66-28835
- GAS LASER AND TELESCOPE TECHNIQUES FOR DEEP SPACE OPTICAL COMMUNICATION SYSTEM NASA-CR-77482 N66-35245
- TRANSMIT BEAM OFFSET AND COARSE ACQUISITION SUBSYSTEMS FOR LASER/OPTICS TECHNIQUE BREADBOARD AND ACQUISITION AND TRACK SIMULATION NASA-CR-81701 N67-18023
- LISITSA, M. P.**  
LASER Q-FACTOR MODULATION BY SPECTRAL ABSORPTION FILTERS WITH INVERSE BLEACHING A66-29354
- RUBY LASER PUMPING THRESHOLD ENERGY, DIVERGENCE ANGLE AND OUTPUT POWER AS AFFECTED BY RESONATOR LENGTH A66-39769
- RUBY LASER PUMPING THRESHOLD ENERGY, DIVERGENCE ANGLE AND OUTPUT POWER AS AFFECTED BY RESONATOR LENGTH A67-12855
- POSSIBLE OSCILLATION MODES IN CYLINDRICAL SOLID STATE LASER AND DEPENDENCE OF PUMPING THRESHOLD, OUTPUT POWER AND DIVERGENCE ANGLE ON RESONATOR LENGTH A67-13129
- OPTICAL METHODS AND EQUIPMENT USED IN CHECKING SURFACE FINISH AND VOLUME AND SURFACE INHOMOGENEITIES OF ACTIVE MEDIA AND INTERFEROMETRIC MIRRORS OF LASERS A67-13143
- LISITSYN, V. N.**  
RADIATION FROM HIGH-ENERGY-LEVEL TRANSITIONS EXCITED IN HE- NE LASER DURING OPTICAL PUMPING WITH HE LAMP A66-34697
- RADIATION FROM HIGH ENERGY LEVEL TRANSITIONS EXCITED IN HE- NE LASER DURING OPTICAL PUMPING WITH HE LAMP A67-10513
- RUBY LASER GENERATION FROM TWO R LINES BY PRISMATIC LIGHT DISPERSION IN RESONATOR A67-13095
- LITVAK, M. M.**  
MASER AMPLIFIER BASED ON UV CONTINUUM PUMPING FROM NEARBY STARS, EXPLAINING 18-CM OH EMISSION FROM ANOMALOUS H-2 REGIONS A66-43042
- ELECTRON RECOMBINATION IN LASER PRODUCED HYDROGEN DISCHARGE, NOTING TEMPERATURE DECAY DUE TO RADIATION, EXPANSION COOLING AND ELECTRON LOSS A67-15109
- LIUBIMOV, V. V.**  
IONIZATION OF AIR WITH LASER RADIATION IN SPIKE MODE A66-31150
- ESTIMATED GREATEST PERMISSIBLE MIRROR MISALIGNMENT, ACTIVE MEDIUM INHOMOGENEITY AND EXTRA-AXIAL BEAM LOSSES FOR ARTIFICIAL REALIZATION OF VERY NARROW RADIATION PATTERN IN REAL LASER A66-41449
- ESTIMATED GREATEST PERMISSIBLE MIRROR MISALIGNMENT, ACTIVE MEDIUM INHOMOGENEITY AND EXTRA-AXIAL BEAM LOSSES FOR ARTIFICIAL REALIZATION OF VERY NARROW RADIATION PATTERN IN REAL LASER A67-14185
- LIUMAROV, E. N.**  
TREATMENT OF STEEL WITH LASER BEAM, OBTAINING PRECISION HOLES WITHOUT AFFECTING MICROHARDNESS OF METAL A67-18234
- LIVSHITS, B. L.**  
EFFECT OF DIFFUSION OF EXCITATION ON CONDITIONS OF

- MULTIMODE GENERATION IN LASER RADIATION  
A67-13207
- LIVSHITZ, B. L.  
CRYSTAL MOTION EFFECT ON TIME BEHAVIOR OF LASER  
GENERATION MODE, USING HIGH SPEED PHOTOGRAPHY AND  
OSCILLOGRAMS A66-29725
- STIMULATED EMISSION SPECTRUM IN AXIAL-MODE MODEL  
OF PLANE RESONATOR IN STATIONARY GENERATION REGIME  
A66-38127
- LOBANOV, V. F.  
MEASUREMENT OF DISTANCE TO MOON BY OPTICAL  
RADAR, DISCUSSING RUBY LASER/PHOTOMULTIPLIER  
APPARATUS AND PROCEDURE A66-30291
- LUNAR FIGURE AND ORBIT PARAMETERS MEASURED BY  
OPTICAL LOCATION METHOD A66-35285
- DESCRIPTION OF RUBY LASER USED IN OPTICAL LOCATION  
OF MOON  
NASA-TT-F-8866 N66-29428
- LOGGINOV, A. S.  
SURFACE EFFECT ON TEMPERATURE, I-V AND WATT-  
AMPERE CHARACTERISTICS OF P-N JUNCTION  
SEMICONDUCTOR INJECTION LASER DIODE AS COHERENT  
LIGHT SOURCE A67-10077
- LONG, L. T.  
LIGHT ENERGY MEASUREMENTS MADE WITH ARGON BOMB  
USED AS CHEMICALLY POWERED LASER PUMP  
A66-35388
- LONG, R. K.  
MEASUREMENT OF SINGLE LINE IN P BRANCH OF CARBON  
DIOXIDE VIBRO-ROTATIONAL ABSORPTION BAND USING  
TUNED OPTICAL MASER SPECTROSCOPY, NOTING PRESENCE  
OF SHIFTED FREQUENCIES A66-28691
- LONGINI, R. L.  
INJECTION LASER COOLING BY REMOVAL OF HEAT FROM  
ENVIRONMENT FOR CONVERSION TO LIGHT  
NASA-CR-76761 N66-32437
- LONGO, S. E.  
LASER COMMUNICATIONS SYSTEM DESIGN, DESCRIBING  
RANGE EQUATION, MODULATION AND DETECTION  
TECHNIQUES, ATMOSPHERIC EFFECTS, ETC  
A66-37257
- LOTSCH, H. K. V.  
MICROWAVE MODELS OF OPTICAL RESONATORS, DISCUSSING  
CORRECTION OF DISCREPANCIES RESULTING FROM  
APPROXIMATIONS IN MEASUREMENTS A66-26006
- LOTSPEICH, J. F.  
SELECTIVE ACCESS LASER DISPLAY BEAM POSITIONER  
RADCR-TR-66-447 N67-15327
- LOVE, J. A., III  
TRANSLUCENT AND OPAQUE PHOTOCATHODES ANALYSIS  
A67-19408
- LOVISETTO, L.  
OPERATION OF Q-SWITCHING DEVICE BASED ON  
FARADAY EFFECT AND USED WITH RUBY LASER FOR  
APPLICATION TO PLASMA DIAGNOSTICS A66-36079
- LOZHNIKOV, A. A.  
LOCAL LASER HEATING OF CATHODE FOR ELECTRON  
EXTRACTION FROM PLASMID A66-29879
- LOZINS, N. G.  
NARROW LASER BEAM POINTING TECHNIQUE IN DEEP  
SPACE-TO-EARTH DATA TRANSMISSION FOR REDUCTION IN  
ERROR SOURCES A66-40496
- LU, S.  
HIGH TIME RESOLUTION POLARIMETER FOR LASER  
ANALYSIS, BEAM INTENSITY AFTER PASSING THROUGH  
ANALYZERS MEASURED BY PHOTOMULTIPLIERS  
A66-37285
- LUBNAU, D. G.  
PROGRAM PLANNING, GROUND SUPPORT AND AIRBORNE  
EQUIPMENT FOR LASER SPACE COMMUNICATION SYSTEM
- NASA-CR-78855 N66-39446
- LUCK, C. F., JR.  
LASER MACHINING, DISCUSSING HOLE DRILLING,  
MICROWELDING METAL REMOVAL AND APPLICATION TO HARD  
BRITTLE MATERIALS  
ASME PAPER 66-MD-28 A66-38484
- LUCY, R.  
OPTICAL SUPERHETERODYNE RECEIVER  
NASA-CR-81659 N67-17982
- LUCY, R. F.  
SENSITIVITY AND TRACKING CAPABILITIES OF PRECISION  
LASER AUTOMATIC TRACKING SYSTEM A66-25984
- LUDMAN, J. E.  
FAR-FIELD LIGHT EMISSION MODE PATTERN OF GA AS  
DIODE INJECTION LASERS, DIELECTRIC GRADIENT IN  
INVERSION LAYER AND REFRACTIVE INDEX IN JUNCTION  
A66-39743
- LUGINA, A. S.  
SUM RADIATION FREQUENCY GENERATION BY RUBY AND  
NEODYMIUM LASERS IN KDP CRYSTALS A67-19734
- LUNDHOLM, T.  
PASCHEN SERIES LASER LINES IN ATOMIC AND  
MOLECULAR HYDROGEN A66-40892
- LURIE, M.  
HOLOGRAM PROCESS FOR OBJECT REFLECTING OR  
DIFFUSING QUASI-MONOCROMATIC LIGHT, INCLUDING  
EFFECTS OF PARTIAL SPATIAL COHERENCE A67-11079
- LYALL, A. E.  
BIPOLAR NI- CD CELLS FOR RUBY LASERS AND POWER  
SOURCES TO YIELD HIGH ENERGY PULSES FOR FIRING  
PYROTECHNIC DEVICES A66-41760
- M**
- MACE, P. M.  
THEORY AND DESIGN OF HIGH POWER LASER FOR  
PRODUCING PLASMAS IN THIN POLYETHYLENE TARGET  
LA-3369 N66-32449
- MAEK, W.  
RING LASER SENSOR PARAMETERS AND CHARACTERISTICS,  
NOTING APPLICATION TO MEASUREMENT OF ANGULAR RATE,  
MASS FLOW, NAVIGATION AND GUIDANCE A66-35533
- MACKENZIE, A. S. V.  
SCHLIEREN PHOTOGRAPHS OF PLASMA DISCHARGES IN  
PARALLEL PLATE RAIL TUBE, USING PULSED RUBY LASER  
AS LIGHT SOURCE A66-41510
- MACLELLAND, J. R.  
SCHLIEREN PHOTOGRAPHS OF PLASMA DISCHARGES IN  
PARALLEL PLATE RAIL TUBE, USING PULSED RUBY LASER  
AS LIGHT SOURCE A66-41510
- MACQUILLAN, A. K.  
ABSORPTION SPECTRA IN OPTICAL REGION WHEN LASER  
RADIATION AND CONTINUOUS RADIATION ARE  
SIMULTANEOUSLY INCIDENT ON MOLECULAR MEDIUM  
A66-26161
- MADHAVAN, D.  
SECOND HARMONIC GENERATIONS AND MIXINGS OF RAMAN  
LINES PRODUCED IN CYCLOHEXANE, ACETONE, BENZENE  
AND CARBON DISULFIDE, PHOTOGRAPHING FIRST ORDER  
STOKES RADIATION A67-12052
- MAEDA, K.  
PHOTOCONDUCTIVE AND LUMINESCENT BEHAVIOR OF  
UNDOPED CADMIUM SULFIDE SINGLE CRYSTALS AT ROOM  
TEMPERATURE UNDER LASER EXCITATION A66-39165
- MAESTRE, A.  
PULSED RUBY LASER PHOTOELECTRIC RECEIVER  
EXPERIMENTS DETERMINING SATELLITE ORBITS,  
SUPPLEMENTING BAKER- NUNN CAMERA NETWORK  
A66-42547

**MAESTRE, L. A.**

RUBY LASER ENERGY REFLECTED OFF EXPLORER XXII  
SATELLITE A66-27054

SATELLITE RANGE MEASUREMENTS USING LASER IN  
CONJUNCTION WITH PHOTOELECTRIC RECEIVER AND  
BAKER- NUNN CAMERA A66-29998

PHOTOGRAPHIC MEASUREMENT OF ENERGY DISTRIBUTION  
IN BEAM OF Q-SWITCHED RUBY LASER  
NASA-CR-75102 N66-26252

RANGE MEASUREMENTS OF GEOS-I AND BE-C SATELLITES  
WITH RUBY LASER  
NASA-CR-77292 N66-34634

**MAGALIAS, V. I.**

SURFACE EFFECT ON TEMPERATURE, I-V AND WATT-  
AMPERE CHARACTERISTICS OF P-N JUNCTION  
SEMICONDUCTOR INJECTION LASER DIODE AS COHERENT  
LIGHT SOURCE A67-10077

TIME STRUCTURE AND AMPLITUDE SELF-MODULATION OF  
EMISSION FROM GA AS INJECTION LASER OBSERVED,  
USING ELECTRON-OPTICAL CONVERTER  
A67-17756

**MAGDICH, L. N.**

STATIC CHARACTERISTICS OF GAS LASER INTERNAL  
MODULATION CIRCUIT, USING ELECTRO-OPTICAL CRYSTAL  
INSERTED INTO GAS LASER RESONATOR  
A66-32225

LASER MODE-LOCKING DURING RESONATOR Q-FACTOR  
MODULATION A66-39303

**MAGILL, P. J.**

SMALL SIGNAL MODULATION EFFECT ON PHOTOELECTRON  
COUNTING OF HE- NE LASER INTENSITY FLUCTUATIONS  
A66-31097

**MAGYAR, G.**

RUBY LASER GIANT PULSE OFF-AXIAL MODES DETECTED  
WITH HIGH RESOLUTION SPHERICAL FABRY- PEROT  
INTERFEROMETER A66-41627

INTENSITY DEPENDENT FREQUENCY SHIFT IN SPECTRAL  
OUTPUT OF MONOCHROMATIC GIANT PULSE LASERS  
MEASURED, USING FABRY- PEROT INTERFEROMETER  
A67-10251

**MAISCHBERGER, K.**

RUBY LASER WHICH PRODUCES TRIGGERABLE GIANT LASER  
PULSES BY Q-SWITCHING WITH SELECTIVE SATURABLE  
ORGANIC DYE  
IPP-4/34 N66-28336

**MAK, A. A.**

EFFECT OF ANOMALOUS DISPERSION ON STIMULATED  
EMISSION SPECTRUM OF DOPED CADMIUM FLUORIDE  
CRYSTALS A66-32317

SINGLE PULSE OPERATION OF LASERS, NOTING ENERGY  
STORAGE AND AMPLIFICATION EFFECT FOR FOUR- AND  
THREE-LEVEL ACTIVE MEDIUM A66-39711

**MAKAROV, N. I.**

TEMPERATURE DISTRIBUTION IN TWO-LAYER PLATE DURING  
WELDING BY LASER LIGHT FLUX A66-40194

TEMPERATURE DISTRIBUTION IN TWO-LAYER PLATE  
DURING WELDING BY LASER LIGHT FLUX  
A67-17548

TEMPERATURE DISTRIBUTION IN BILAYER SHEET DURING  
WELDING WITH LASER BEAM  
JPRS-37856 N66-39411

**MAKER, P. D.**

NONLINEAR LIGHT SCATTERING IN PRESSURIZED METHANE,  
NOTING DISPLACEMENT OF SPECTRAL LINE FROM LASER  
FREQUENCY A66-26148

**MALACARA-HERNANDEZ, D.**

LATERAL SHEARING INTERFEROMETER WITH GAS-LASER  
LIGHT SOURCE FOR TESTING LARGE OPTICAL SYSTEMS  
A66-27320

**MALLORY, W. R.**

LIGHT REFLECTION FROM SHOCK WAVES CLARIFIED  
THROUGH PROPAGATION IN SHOCK TUBES, USING GAS  
LASER A66-40012

**MALMSTROM, L. D.**

MAGNETIZATION INDUCED BY CIRCULARLY POLARIZED  
LASER LIGHT INCIDENT ON NONABSORBING MATERIAL, IN  
ABSENCE OF EXTERNAL MAGNETIC FIELD, IN DOPED  
CALCIUM FLUORIDE PROPORTIONAL TO LIGHT INTENSITY  
AND VERDET CONSTANT A66-26142

**MALYSHEV, G. M.**

SHAPE AND DIMENSION OF SPARK ARISING DURING  
FOCUSING OF LASER EMISSION A66-29210

SHAPE AND DIMENSION OF SPARK ARISING DURING  
FOCUSING OF LASER EMISSION A66-33059

ELECTRON TEMPERATURE AND CONCENTRATION IN DC  
PLASMA ARC DETERMINED FROM THOMSON SCATTERING OF  
LASER RADIATION A66-33840

SOVIET AND FOREIGN PAPERS ON PLASMA DIAGNOSTICS  
BY SCATTERING OF LASER BEAMS AT PLASMA ELECTRONS  
A66-34967

ELECTRON TEMPERATURE AND CONCENTRATION IN DC  
PLASMA ARC DETERMINED FROM THOMSON SCATTERING OF  
LASER RADIATION A67-13209

**MALYSHEV, V. I.**

GAS LASER OUTPUT AND THRESHOLD IN POPULATION  
INVERSION FROM PHOTODISSOCIATION OF METHYL IODIDE  
AND FLUOROIODO METHYLDIYNE A66-35368

GIANT PULSE FORMATION THEORY, MEASURING SHAPE AND  
DURATION OF NEODYMIUM GLASS LASER PULSES FOR  
VARIOUS VALUES OF INVERSE POPULATION  
A66-37367

DEPENDENCE OF BEAT FREQUENCY OF NEODYMIUM LASER  
AXIAL MODES ON DISTANCE BETWEEN MIRRORS AND  
NEODYMIUM ROD POSITION WITHIN RESONATOR  
A66-41088

GIANT PULSE FORMATION THEORY, MEASURING SHAPE AND  
DURATION OF NEODYMIUM GLASS LASER PULSES FOR  
VARIOUS VALUES OF INVERSE POPULATION  
A67-17876

**MAMEDZADE, S. M.**

RUBY LASER MONOCHROMATIC RADIATION SEPARATION BY  
TAPERED MULTIPLEX INTERFEROMETER WITH OPPOSITION  
DISPERSION A66-26471

MULTIPLEX LIGHT FILTER FOR EXCITATION OF RUBY  
LASER A66-30853

OBTAINING HIGHLY MONOCHROMATIC RADIATION ON SINGLE  
WAVE FROM RUBY LASER A66-31809

**MANDELSTAM, S. L.**

GIANT-PULSE LASER-INDUCED ATMOSPHERIC ELECTRIC  
BREAKDOWN CAUSING OPTICAL FREQUENCY DISCHARGE  
A66-26194

**MANKO, M. A.**

TEMPERATURE DEPENDENCE OF THRESHOLD CURRENT IN  
INJECTION LASERS IN CONTINUOUS OPERATION UNDER  
LIQUID NITROGEN COOLING A67-18788

SEMICONDUCTOR MIRROR FOR Q-FACTOR MODULATION OF  
LASER RESONATOR A67-18789

**MANLEY, G. W.**

1.60 MICRON STIMULATED AND SPONTANEOUS EMISSIONS  
FROM EPITAXIAL SINGLE CRYSTALS IN QUASI-BINARY  
III-V COMPOUND SEMICONDUCTOR DIODES OF INJECTION  
LASERS AT 77 DEGREES K A66-39750

**MARANTZ, H.**

RELATIVE INTENSITIES AND CASCADE TRANSITION RATIO  
IN CW AR II LASER NEAR 4103.9 ANGSTROMS  
A67-19560

**MARCHENKO, V. M.**

STIMULATED EMISSION FROM SAMARIUM-DOPED CALCIUM  
FLUORIDE CRYSTAL EXCITED BY RUBY LASER

- A66-29358  
STIMULATED EMISSION FROM SAMARIUM-DOPED CALCIUM FLUORIDE CRYSTAL EXCITED BY RUBY LASER  
A66-37362
- DIVALENCE SAMARIUM ION DOPED CALCIUM FLUORIDE LASER ACTION AT LOW TEMPERATURES OBTAINED WITH GIANT PULSE RUBY LASER EXCITATION  
A67-16661
- MARCOS, H. M.  
NEODYMIUM-DOPED YTTRIUM-ALUMINUM GARNET CRYSTAL LASER OSCILLATOR AS REGENERATIVE AMPLIFIER OF NOISE  
A66-26212
- ULTRASHORT OPTICAL PULSES GENERATED BY MODE LOCKING CONTINUOUS NEODYMIUM DOPED YTTRIUM-ALUMINUM GARNET LASER  
A66-29391
- MARENNIKOV, S. I.  
RUBY LASER-INDUCED EFFECT OF PULSED PRESSURE ON KDP CRYSTAL SURFACE AND THERMAL BULK EFFECT ON EXCITATION OF ULTRASONIC OSCILLATION IN CRYSTAL  
A66-40318
- RUBY LASER FREQUENCY CONVERSION TECHNIQUE BY LASER BEAM SCATTERING AND MIXING OF COMBINED FREQUENCIES  
A67-13094
- MARFAING, Y.  
SEMICONDUCTOR LASERS AND FAST IR DETECTORS, DISCUSSING IN AS, IN SB AND THREE TYPES OF MERCURY CADMIUM TELLURIDE DETECTORS  
A67-16668
- MARGERUM, E. A.  
LIGHT SCATTERING TECHNIQUES FOR CRYSTAL EVALUATION  
AFCL-66-119  
N66-26436
- MARGOSHES, M.  
SPECTROCHEMICAL ANALYSIS OF SOLID SPECIMEN FROM VAPOR FORMED BY LASER BEAM AND EXCITED BY SPARK DISCHARGE  
A67-16786
- MARKIEWICZ, J. P.  
CURRENT TRANSDUCER FOR MEASURING CURRENT PULSES IN KILOAMPERE RANGE AND SUITABLE FOR LASER RESEARCH APPLICATIONS  
A66-42820
- MARKIN, A. S.  
GIANT PULSE FORMATION THEORY, MEASURING SHAPE AND DURATION OF NEODYMIUM GLASS LASER PULSES FOR VARIOUS VALUES OF INVERSE POPULATION  
A66-37367
- DEPENDENCE OF BEAT FREQUENCY OF NEODYMIUM LASER AXIAL MODES ON DISTANCE BETWEEN MIRRORS AND NEODYMIUM ROD POSITION WITHIN RESONATOR  
A66-41088
- GIANT PULSE FORMATION THEORY, MEASURING SHAPE AND DURATION OF NEODYMIUM GLASS LASER PULSES FOR VARIOUS VALUES OF INVERSE POPULATION  
A67-17876
- MARKIN, E. P.  
TRAVELING WAVE BEATS CREATED BY RING LASER ON ROTATING PLATFORM, NOTING FREQUENCY DIVISION ROTATING RATE AND CAPTURE BAND PARAMETERS  
A66-25102
- TRAVELING WAVE BEATS CREATED BY RING LASER ON ROTATING PLATFORM, NOTING FREQUENCY DIVISION ROTATING RATE AND CAPTURE BAND PARAMETERS  
A66-30281
- MARSTEN, R. B.  
COMMUNICATION SYSTEMS AT MICROWAVE AND OPTICAL FREQUENCIES FOR FUTURE MARS MISSIONS  
A66-33793
- SPACE COMMUNICATION REQUIREMENTS USING LASERS AND MICROWAVES IN MANNED MARS FLIGHTS  
AIAA PAPER 65-324  
A66-33794
- MARTELLUCCI, S.  
IMPLOSION OF FAST NONPREIONIZED THETA PINCH STUDIED, USING FIRST AND SECOND HARMONIC OF RUBY LASER LIGHT  
A66-37638
- MARTIENSSEN, W.  
STATISTICAL ANALYSIS OF LIGHT FIELDS CREATED BY SUPERPOSITION OF LASER LIGHT AND CHAOTIC LIGHT  
A66-29815
- MARTIN, M. D.  
MOLECULAR OSCILLATION DIFFERENCE FREQUENCY GENERATION IN IR SPECTRUM BY BEATING TOGETHER LASER AND LASER-STIMULATED RAMAN EMISSION  
A66-42544
- MARTINELLI, J.  
DAMAGE THRESHOLDS FOR VARIOUS GLASSES EXPOSED TO LASER PULSES, EMPHASIZING INTERNAL DAMAGE  
A66-28732
- MARTINELLI, R. U.  
NONUNIFORM PUMPING EFFECTS ON NEAR-AXIAL LOW-ORDER TRANSVERSE MODE STRUCTURE IN SOLID STATE LASER CAVITY  
A66-31087
- MARTINEZ, J. V.  
LASER ACTION DELAY DUE TO PLASMA-TUBE-SURFACE DECOMPOSITION RESULTING FROM BOMBARDMENT BY NEON IONS  
A67-15110
- MARTINI, L.  
X-BAND RUBY MASER DESIGN WITH LIQUID HYDROGEN COOLING FOR HIGH GAIN AT LOW PUMPING POWER  
A67-19131
- MARUSHKO, I. A.  
SECOND HARMONIC GENERATION BY LASER BEAMS OF FINITE SPECTRAL WIDTH, USING QUANTUM TRANSITIONS AND KINETIC EQUATIONS, NOTING SHAPE OF PUMPING LINE AT FUNDAMENTAL FREQUENCY  
A66-30845
- KINETIC EQUATION DERIVATION FROM DENSITY MATRIX FOR CASE OF QUANTUM GENERATION OF SECONDARY OPTICAL HARMONIC IN LASER CAVITY UNDER VARIOUS OPTICAL PUMPING CONDITIONS  
A67-13127
- MARUYAMA, M.  
RUBY CRYSTALS GROWN BY CZOCHRALSKI TECHNIQUE USING INDUCTION HEATED IRIIDIUM CRUCIBLE, NOTING LASER OSCILLATIONS IN PULLED CRYSTALS  
A67-16975
- MARX, G.  
INTERSTELLAR VEHICLE PROPELLED BY TERRESTRIAL LASER BEAM  
A66-35488
- MAS, G.  
INTERFERENCES BETWEEN WAVES DIFFRACTED BY CIRCULAR SCREENS OR THIN WIRES AND COHERENT BACKGROUND PROVIDED BY LASER, PRODUCING RINGS OR RECTILINEAR FRINGES  
A67-10231
- INTERFERENCES BETWEEN COHERENT LIGHT BACKGROUND AND LIGHT DIFFRACTED BY SMALL APERTURE IN CASE OF STRONGLY ASTIGMATIC BEAM  
A67-14416
- MASH, D. I.  
AXIAL MAGNETIC FIELD EFFECT ON NE-HE LASER POWER OUTPUT OPERATING IN REGIME OF SIMULTANEOUS GENERATION OF 3.39 AND 0.6328 MICRON LINES  
A67-19601
- MASHKEVICH, V. S.  
SECOND HARMONIC GENERATION BY LASER BEAMS OF FINITE SPECTRAL WIDTH, USING QUANTUM TRANSITIONS AND KINETIC EQUATIONS, NOTING SHAPE OF PUMPING LINE AT FUNDAMENTAL FREQUENCY  
A66-30845
- BOOK ON LASER THEORY BASED ON KINETIC EQUATIONS WITH EMPHASIS ON EMISSION FROM LUMINESCENT CENTER TRANSITIONS, SEMICONDUCTOR JUNCTIONS AND RAMAN SCATTERING  
A66-32558
- LIGHT ABSORPTION BY FREE CURRENT CARRIERS ROLE IN KINETIC EQUATIONS OF SEMICONDUCTOR LASER/RADIATION SYSTEM  
A66-34691
- KINETIC EQUATION DERIVATION FROM DENSITY MATRIX FOR CASE OF QUANTUM GENERATION OF SECONDARY OPTICAL HARMONIC IN LASER CAVITY UNDER VARIOUS OPTICAL PUMPING CONDITIONS  
A67-13127

- LASER TYPE REGIME OF SEMICONDUCTOR HAVING RADIATION INDUCED BY IMPURITY BAND TRANSITIONS OF CURRENT CARRIERS A67-13137
- LIGHT ABSORPTION BY FREE CURRENT CARRIERS ROLE IN KINETIC EQUATIONS OF SEMICONDUCTOR LASER/RADIATION SYSTEM A67-14376
- MASHTAKOV, V. S.  
FORCED EMISSION FROM ELECTRON-EXCITED CADMIUM SELENIDE A66-35788
- MASSEY, G. A.  
INTERNAL PHASE MODULATION IN HE-NE LASER USING ELECTRO-OPTIC EFFECT IN CRYSTAL QUARTZ, OBSERVING SPECTRUM AND RF MODE BEATS A66-32621
- LASER TECHNIQUES FOR DETECTING AND MEASURING VIBRATIONS OF SPACECRAFT MODEL ON SHAKE TABLE NASA-CR-75643 N66-27953
- MASTERSON, J. E.  
LASER SYSTEM FOR METEOROLOGICAL DATA USING OSCILLOSCOPE TO DISPLAY RETURN SIGNAL, TRANSLATED AS CONCENTRATIONS OF MATTER OR AEROSOLS A66-43044
- SMALL LASER RADAR APPLIED TO METEOROLOGICAL STUDIES PMR-TM-66-6 N67-12294
- MATHIEU, E.  
SECOND HARMONIC FREQUENCY GENERATION OBTAINED IN PROCESS OF OPTICAL MIXING OF COLLINEAR NEODYMIUM LASER BEAMS IN POTASSIUM DIHYDROGEN PHOSPHATE A66-37550
- MATSUDA, M.  
REFLECTING MIRRORS IN LASER OSCILLATORS TREATED AS REFLECTING ELEMENTS AND TRANSDUCERS FOR COUPLING POWER FROM OSCILLATOR TO EXTERNAL SPACE A66-40184
- MATSUZAWA, H.  
OPTIMAL DESIGN OF ELLIPTICAL PUMPING CHAMBERS FROM NUMERICAL CALCULATIONS CONTAINING ALL GEOMETRIC SIZES OF PUMPING LAMPS AND LASER RODS AND REFLECTIVITY OF WALLS A67-19490
- MAX, E.  
DYNAMIC LASER WAVELENGTH SELECTION BY INSERTION OF DISPERSIVE TUNABLE ELECTRO-OPTIC Q-SPOILER WITHIN LASER CAVITY A66-40866
- MAY, A. D.  
DUST PARTICLES IN LASER CAVITY OBSERVED FOR ANGULAR STABILIZATION AND CONSTANT VELOCITIES A66-26594
- MAYER, G.  
RAMAN LIGHT FORWARD EMISSION IN LIQUIDS WHEN ILLUMINATED BY LASER, OBTAINING STIMULATED RAMAN ACTION WITHOUT FEEDBACK, WHICH SUGGESTS EXISTENCE OF MECHANISM CONTRIBUTING TO MODULATION OF MEDIUM POLARIZABILITY A66-26160
- MAYHALL, D. J.  
HIGH-TEMPERATURE RESEARCH WITH INFRARED MASER FOR TIME-SPACE RESOLVED DIAGNOSTICS OF DEUTERIUM PLASMAS ARL-65-270 N66-30302
- MAZELSKY, R.  
EXCITATION RADIATION TRANSFER FROM TRIVALENT CHROMIUM TO NEODYMIUM EXAMINED VIA FLUORESCENCE SPECTROSCOPY, NOTING ENERGY TRANSFER PARAMETERS AND EFFECT ON LASER OUTPUT A66-26175
- MAZUROV, I. U. A.  
RESONATOR MADE OF MAGNETIC MATERIALS FOR TUNING MOLECULAR GENERATOR BY ZEEMAN MODULATION A66-39851
- MAZZUCATO, E.  
PLASMA PRODUCTION BY FIRING GIANT PULSE LASER AT SOLID DEUTERIUM PELLETS /ICE/, NOTING STRONG ANISOTROPY IN PLASMA OUTBURST A66-36595
- IMPLOSION OF FAST NONPREIONIZED THETA PINCH STUDIED, USING FIRST AND SECOND HARMONIC OF RUBY LASER LIGHT A66-37638
- MC CARTNEY, A. J.  
RUBY LASER INJURY TO EYE OF MONKEYS, MACACA CYNOMOLGUS AND CERCOCEBUS TORQUATUS ATYS A67-80364
- MC CLUNG, F. J.  
HIGH ENERGY DIFFRACTION LIMITED RAMAN LASER REALIZATION STUDIES AD-636250 N66-37176
- MC DOWELL, F.  
ENERGY-LOSING BLEACHING MECHANISM OF ORGANIC PHOTOTROPIC CRYSTALS USED FOR RUBY LASER SWITCHES ATD-66-119 N67-10437
- MC FARLAND, B.  
FEASIBILITY OF USING FLUORESCING DYES PUMPED WITH RUBY LASER FOR LOWER THRESHOLDS THAN RAMAN TYPE LASERS AD-636953 N66-38187
- MC GANN, E. L.  
DESIGN AND PERFORMANCE OF CW GAS LASER TRACKER N66-36554
- MC LAURIN, R. L.  
CEREBRAL CORTEX OF DOG AS AFFECTED BY LASER RADIATION A66-82035
- MC LEAN, E. A.  
SELF-FOCUSING AND TRAPPING OF LASER BEAM IN LIQUID N67-12650
- MC MAHON, J. M.  
FARADAY EFFECT AS SWITCHING TECHNIQUE FOR HIGH POWER LASER OUTPUT N67-12651
- MC MURTRY, B. J.  
OPERATION AND IMPROVEMENT OF FREQUENCY MODULATED AND SUPER-MODE LASERS IER-3 N66-30672
- MC WHORTER, A. L.  
SOLID STATE DEVICE, LASER, MATERIALS, AND PHYSICS RESEARCH PROJECTS ESD-TOR-65-553 N66-23942
- MCAVOY, M.  
FLUORESCENCE QUANTUM EFFICIENCIES OF OCTA-COORDINATED EUROPIUM HOMOGENEOUS AND MIXED CHELATES IN ORGANIC SOLVENTS, NOTING EFFECT OF OXYGEN REMOVAL A66-41153
- MCCARTNEY, E. J.  
RING LASER INERTIAL SENSOR FOR AEROSPACE SYSTEMS OBTAINING HIGH ACCURACY ANGULAR RESOLUTION AND MECHANICAL SIMPLICITY A67-15665
- MCCLUNG, F. J.  
DISCREPANCY BETWEEN CALCULATED AND EXPERIMENTAL VALUES FOR RAMAN GAIN IN PULSED LASER SUGGESTS HIGHER ENERGY DISTRIBUTION DUE TO LIGHT TRAPPING OR BRILLOUIN SCATTERING A66-26157
- MCCOY, J.  
INEXPENSIVE CARBON DIOXIDE MOLECULAR GAS LASER USING PLANO-CONCAVE EYEGLASS LENSES A67-10827
- MCCRAY, R.  
NEGATIVE ABSORPTION IN COSMIC RADIO SOURCES OF SYNCHROTRON RADIATION A67-15200
- MCCUBBIN, T. K., JR.  
VIBRATIONAL-ROTATIONAL LINE STRENGTHS AND WIDTHS IN CARBON DIOXIDE, USING CARBON DIOXIDE-NEON LASER A66-27030
- MCCULLOUGH, A. W.  
INTERNAL SELF-DAMAGE IN 25 MW RUBY LASER OSCILLATOR ROD A66-41160

- RUBY LASER GIANT PULSE OFF-AXIAL MODES DETECTED  
WITH HIGH RESOLUTION SPHERICAL FABRY-PEROT  
INTERFEROMETER A66-41672
- MCCUMBER, D. E.  
LINEARIZED POPULATION RATE EQUATIONS AND QUANTUM  
NOISE SOURCES USED TO CALCULATE SPECTRA OF  
INTRINSIC SECOND MOMENT INTENSITY FLUCTUATIONS IN  
3- AND 4-LEVEL CW LASER OSCILLATORS A66-42548
- MCCURDY, G. B.  
ISOTOPE SHIFTS AND FERMI RESONANCE ROLE IN CARBON  
DIOXIDE IR LASER A66-30176
- ISOTOPE SUBSTITUTION EFFECT ON NATURAL FREQUENCIES  
OF VIBRATIONAL-ROTATIONAL TRANSITIONS IN DIATOMIC  
AND TRIATOMIC MOLECULES AND GENERATION OF NEW IR  
MASER FREQUENCIES A67-16634
- MCFARLAND, B. B.  
HOLE BURNING IN BLEACHABLE ABSORBERS USED AS LASER  
Q-SPOILER A66-29387
- MCFARLANE, R. A.  
SPECTROSCOPY OF IR EMISSION AND LASER OSCILLATION  
RESULTING FROM TRANSIENT POPULATION INVERSIONS ON  
ELECTRONIC TRANSITIONS IN MOLECULAR NITROGEN A66-42550
- MCGANN, E. J.  
SENSITIVITY AND TRACKING CAPABILITIES OF PRECISION  
LASER AUTOMATIC TRACKING SYSTEM A66-25984
- MCGANN, E. L.  
PRECISION AUTOMATIC TRACKING USING CW HE-NE  
LASER, NOTING PERFORMANCE AND APPLICATION A66-28448
- MCKENNA, J.  
PUMPING ENERGY DISTRIBUTION OF RUBY LASER,  
DISCUSSING EXISTENCE OF TRAPPED MODES AND EFFECT  
OF PARTIALLY FILLED WATER JACKET SURROUNDING RUBY  
RODS A66-35389
- MCLEAN, T. P.  
PHOTON COUNTING DISTRIBUTIONS AND INTENSITY  
FLUCTUATIONS OF MODULATED LASER BEAMS A67-20125
- MCLEARY, R.  
ABSORBER RELAXATION EFFECT ON PASSIVE Q-SWITCH  
PULSE LASER A66-27029
- MCMAHAN, W. H.  
C W ARGON ION LASER SCATTERING IN ARGON PLASMA,  
NOTING RESONANCE AND CORRELATION BETWEEN DATA AND  
PLASMA PROPERTIES A67-16665
- MCNICE, G. T.  
FISSION OR RADIOISOTOPIC NUCLEAR RADIATION APPLIED  
TO LASER PUMPING, DISCUSSING FORMS, SOURCES,  
POWER, SOLID STATE AND MOLECULAR GAS LASERS,  
ENERGY TRANSFER, OPTICAL FLUORESCENCE AND CUT-OFF  
PHENOMENON A67-16547
- MCWHORTER, A. L.  
CROSS SECTION FOR INELASTIC SCATTERING OF  
ELECTROMAGNETIC RADIATION BY ELECTRON DENSITY  
FLUCTUATIONS IN ANISOTROPIC SOLIDS, USING LASER  
SOURCES, INVESTIGATING LANDAU AND COLLISION  
DAMPING OF PLASMONS A66-26153
- MASER AMPLIFIER BASED ON UV CONTINUUM PUMPING  
FROM NEARBY STARS, EXPLAINING 18-CM OH EMISSION  
FROM ANOMALOUS H-2 REGIONS A66-43042
- MEAD, C. A.  
GA AS CRYSTAL AS ELECTRO-OPTIC MODULATOR AT 10.6  
MICRONS DUE TO SMALL CARRIER ABSORPTION, FREEDOM  
FROM INTERBAND TRANSITIONS AND HIGH RESISTIVITY  
A66-42553
- MEADORS, J. G.  
MULTIPHOTON ABSORPTION PROCESSES, COHERENCE OF  
RADIATION FIELDS AND STATISTICAL PROPERTIES OF  
LASER LIGHT ABSORPTION A67-16681
- MEERS, M. L.  
MASER AMPLIFIER BASED ON UV CONTINUUM PUMPING  
FROM NEARBY STARS, EXPLAINING 18-CM OH EMISSION  
FROM ANOMALOUS H-2 REGIONS A66-43042
- MEGO, A.  
ALIGNMENT OF ANGULAR POSITIONS OF SPHERICAL MIRROR  
AND GRATING OF FASTIE-EBERT SPECTROMETER, USING  
BRIGHT COLLIMATED MONOCHROMATIC BEAM OF HE-NE  
LASER A66-26564
- MELNGAILIS, I.  
IN AS LASER EMISSION, DISCUSSING RADIATIVE  
TRANSITIONS, COHERENT EMISSION FROM IN AS DIODES,  
RECOMBINATION MECHANISMS IN IR RADIATION SPECTRA,  
ETC A66-25065
- SEMICONDUCTOR BULK INJECTION LASER COMPARED TO  
JUNCTION LASERS, NOTING IN SB NPP STRUCTURES  
A66-25556
- SPONTANEOUS AND COHERENT PHOTOLUMINESCENCE IN  
CADMIUM MERCURY TELLURIDE CRYSTALS EXCITED  
OPTICALLY BY GA AS DIODE LASER A66-29390
- COHERENT AND SPONTANEOUS EMISSION FROM LEAD-TIN  
TELLURIDE ALLOYS UPON EXCITATION BY GA AS DIODE  
LASER, NOTING BAND STRUCTURE OF ALLOY SYSTEM  
A66-34159
- MENTSER, A. N.  
SPECTRAL CHARACTERISTICS OF TWO-PHOTON OPTICAL  
EXCITATION AND LIGHT EMISSION FROM CD SE  
SEMICONDUCTOR LASER WITH MODULATED Q-FACTOR  
A66-37565
- SPECTRAL CHARACTERISTICS OF TWO-PHOTON OPTICAL  
EXCITATION AND LIGHT EMISSION FROM CD SE  
SEMICONDUCTOR LASER WITH MODULATED Q-FACTOR  
A67-15299
- MERCER, G. N.  
TEMPERATURES, LORENTZIAN WIDTHS AND DRIFT  
VELOCITIES OF EXCITED NEUTRAL AND IONIC SPECIES IN  
ARGON-ION LASER, NOTING THERMAL EQUILIBRIUM  
ACHIEVEMENT A66-28695
- ACTUAL LINE SHAPE EXPECTED FROM ACCELERATING  
RADIATING ION, ERRORS DUE TO LORENTZIAN  
APPROXIMATION AND RESULTS FOR ION LASER TRANSITION  
IN RARE GAS LASERS A66-30181
- ABSOLUTE DIRECT EXCITATION CROSS SECTION FROM  
NEUTRAL GROUND STATE FOR UPPER LEVELS OF  
TRANSITION IN ARGON LASER A67-12520
- MERRAN, P. A.  
DETECTION OF VERY LOW LEVELS OF MODULATION ON  
LASER BEAM TO DETERMINE PERFORMANCE OF MICROWAVE  
LIGHT MODULATORS A66-29682
- MERZKIRCH, W. F.  
COMPRESSIBLE AND INCOMPRESSIBLE FLOWS MADE VISIBLE  
BY OPTICAL METHOD SENSITIVE TO DENSITY VARIATIONS,  
SHADOWGRAPH, SCHLIEREN SYSTEM, MACH-ZEHNDER  
INTERFEROMETER AND HOLOGRAPHIC INTERFEROMETRY WITH  
LASERS A66-43196
- MESHCHERIAKOV, A. V.  
EMISSION LOSSES IN SOLID STATE LASER RESONATOR  
CALCULATED FOR ND GLASS LASER A67-13133
- MESKIN, S. S.  
RECOMBINATION RADIATION FROM GA AS P-N  
JUNCTIONS WITH AND WITHOUT FABRY-PEROT  
RESONATOR, NOTING PARAMETER DEPENDENCE ON CURRENT  
DENSITY A66-40314
- MET, V.  
GAS LASER USED TO DETERMINE RESIDUAL WEDGE ANGLE  
IN OPTICAL FLATS AND DIRECT DISPLAY OF RELIEF MAPS  
A66-35390
- MEYER-ARENDT, J. R.  
FLUCTUATIONS IN MEAN REFRACTIVE INDEX OVER LONG  
PATH THROUGH TURBULENT ATMOSPHERE EXAMINED, USING  
MICHELSON INTERFEROMETER WITH HE-NE LASER  
SOURCE A66-32618

- MEYER, J. W.  
GALLIUM ARSENIDE DIODE LASER AS PULSED IR SOURCE  
FOR EXPERIMENT AND DESIGN CONSIDERATIONS FOR RADAR  
INDICATION OF CLOUD HEIGHT AND VISIBILITY  
A66-33616
- MEYERAND, R. G., JR.  
ELECTRICAL BREAKDOWN OF GASES BY OPTICAL FREQUENCY  
RADIATION, NOTING LASER BEAM ATTENUATION AND  
SUBSEQUENT ENERGY ABSORPTION BY PLASMA  
A66-26190
- MICHON, M.  
TERMINAL LEVEL LIFETIME AND FLUORESCENCE LINE OF  
NEODYMIUM DOPED GLASS INFLUENCE ON DYNAMICS AND  
EFFICIENCY OF Q-SPOILED LASER  
A67-16675
- MICKEY, D. L.  
ONE-DIMENSIONAL HEAT FLOW EQUATION FOR LIQUID  
NITROGEN END-COOLED RUBY LASER ROD  
A66-38386
- MIGNE, J.  
NONRECIPROCAL EFFECTS ASSOCIATED WITH EXCITATION  
CURRENT OBSERVED IN D C-EXCITED HE- NE RING  
LASER, NOTING COUPLING PHENOMENA BETWEEN RIGHT  
AND LEFT WAVES  
A66-37408
- MIKAEIAN, A. L.  
PARASITIC INTERNAL OSCILLATIONS IN LASER CRYSTAL  
WITH DIELECTRIC ROD CAUSED BY TOTAL REFLECTION  
FROM GENERATRIX OF CYLINDRICAL SAMPLE  
A66-41477
- COMPUTER CALCULATIONS PERMITTING INVESTIGATION OF  
TIME CHARACTERISTICS OF RADIATION IN INVESTIGATION  
OF LASER WITH PASSIVE CELL  
A67-13962
- STEADY STATE LASER DESIGN, COMPARING BALANCE  
METHOD WITH METHOD BASED ON QUASI-CLASSICAL THEORY  
A67-20245
- MIKAEIANE, A. L.  
SEMICLASSICAL AND RATE EQUATIONS COMPARED FOR  
DETERMINATION OF OUTPUT POWER OF STEADY STATE RUBY  
LASER  
A67-16628
- MIKAEYAN, A. L.  
DESIGNS OF QUANTUM ELECTRONIC SYSTEMS - RUBY  
LASERS, QUANTUM AND OPTICAL GENERATORS, OPTICAL  
GATES, WAVEGUIDES, ELECTROMAGNETIC WAVE  
PROPAGATION, AND COMMUNICATION SYSTEMS  
JPRS-37132  
N66-37709
- MIKHAILOV, G. V.  
GAS LASER OUTPUT AND THRESHOLD IN POPULATION  
INVERSION FROM PHOTODISSOCIATION OF METHYL IODIDE  
AND FLUOROIODO METHYLIDYNE  
A66-35368
- MIKHENKO, G. A.  
NE- HE LASER OUTPUT DEPENDENCE ON PRESSURE AND  
NONEXCITED ATOM CONCENTRATION  
A66-34696
- NE- HE LASER OUTPUT DEPENDENCE ON PRESSURE AND  
NONEXCITED ATOM CONCENTRATION  
A67-10512
- MIKHNOV, S. A.  
MATHEMATICAL FORMULAS TO DETERMINE RADIATION  
LOSS MEASUREMENT IN RUBY LASER  
TG-230-T468  
N66-34235
- MILLER, B.  
LASER LINE-SCANNING PHOTOGRAPHIC SYSTEM,  
DISCUSSING POSSIBLE EXTRATERRESTRIAL APPLICATIONS  
A67-19011
- MILLER, C. R.  
OPTICAL INSTRUMENTATION RADAR FOR REAL-TIME  
POSITIONAL DATA ON HIGH-SPEED COOPERATIVE TARGETS  
A66-25654
- MILLER, R. A.  
DAMAGE IN GLASS INDUCED BY LINEAR ABSORPTION OF  
LASER RADIATION NON- Q-SPOILED  
A67-16794
- MILLER, R. C.  
PARAMETRIC OSCILLATOR THEORY APPLIED TO TUNABLE  
COHERENT OPTICAL PARAMETRIC OSCILLATION IN LITHIUM  
NIOBATE  
A66-26145
- ELECTRON IMPACT EXCITATION MECHANISM OF ARGON-ION  
CONTINUOUS AND LONG PULSE LASERS  
A66-26206
- SECOND-HARMONIC GENERATION BY FOCUSED LASER BEAMS  
BASED ON EXPERIMENTS USING HE- NE GAS LASER,  
NOTING SHG SHOULD BE STRONGLY PEAKED WHEN FOCUS  
IS AT EITHER OF CRYSTAL SURFACES  
A66-38554
- MILLER, S. E.  
OPTICAL COMMUNICATION SYSTEMS, DISCUSSING  
AVAILABLE EQUIPMENT, TRANSMISSION CHARACTERISTIC,  
LACK OF LONG DISTANCE OPERATION RELIABILITY, ETC  
A66-42805
- MILLS, E. D.  
GALLIUM ARSENIDE DIODE LASER AS PULSED IR SOURCE  
FOR EXPERIMENT AND DESIGN CONSIDERATIONS FOR RADAR  
INDICATION OF CLOUD HEIGHT AND VISIBILITY  
A66-33616
- MINCK, R. W.  
PLASMA RESONANCE AND SCATTERING, THRESHOLD  
VARIATION AND OPTICAL REFLECTIVITY IN PULSED LASER  
BEAM-INDUCED GAS BREAKDOWN  
A66-26192
- NONLINEAR OPTICS EMPHASIZING PARAMETRIC  
OSCILLATION, SELF-FOCUSING AND TRAPPING OF LASER  
BEAMS AND STIMULATED RAMAN, RAYLEIGH AND  
BRILLOUIN SCATTERING, USING MAXWELL EQUATIONS  
AND ELECTRIC DIPOLE APPROXIMATION  
A66-42810
- MINTON, J. P.  
TISSUE DESTRUCTION BY LASER RADIATION, ITS  
MANAGEMENT AND PREVENTIVE MEASURES  
A66-81926
- MIRGALOVSKAIA, M. S.  
MINIMUM SPECTRAL LINE WIDTH, THRESHOLD CURRENT  
DENSITY, RADIATION-PEAK DISPLACEMENT AND POSSIBLE  
RECOMBINATION MECHANISM FOR GA SB LASER DIODE P-N  
JUNCTIONS IN COHERENT RADIATION  
A66-31764
- MINIMUM SPECTRAL LINE WIDTH, THRESHOLD CURRENT  
DENSITY, RADIATION-PEAK DISPLACEMENT AND POSSIBLE  
RECOMBINATION MECHANISM FOR GA SB LASER DIODE P-N  
JUNCTIONS IN COHERENT RADIATION  
A67-10085
- MIRKIN, L. I.  
LASER BEAM EFFECT ON HARDENING OF STEEL  
A66-31802
- ORGANIC GLASS DISINTEGRATION INDUCED BY PULSED  
LASER BEAMS  
A67-12241
- MICRO- AND MACROCRACK FORMATION IN ORGANIC GLASS  
BY FOCUSING OF LASER BEAM  
A67-18808
- MISOZHNIKOV, G. S.  
DISPERSION CHARACTERISTIC OF STUB SLOW-WAVE  
STRUCTURE, PARTIALLY FILLED BY DIELECTRIC, OF  
TRAVELING WAVE MASER  
A66-28291
- MITCHELL, R. C.  
TEMPERATURE SHIFT OF RUBY LASER EMISSION MEASURED  
INTERFEROMETRICALLY FOR TEMPERATURES BETWEEN 66  
AND 210 DEGREES K  
A66-28701
- ABSORPTION COEFFICIENTS FOR ALPHA-POLARIZED  
RADIATION USING RUBY LASER AS COHERENT SOURCE AND  
EBERT SPECTROMETER AS INCOHERENT SOURCE  
TR-4  
N66-34159
- MITSUYAMA, A.  
ENERGIES OF IONS GENERATED FROM METAL SURFACE  
IRRADIATED BY SINGLE GIANT PULSE LASER  
A66-38412
- MOCKER, H. W.  
OUTPUT CHARACTERISTICS OF HALF-WAVE MODE KERR  
CELL RUBY OSCILLATOR USED AS OPTICAL RADAR FOR  
CLEAR AIR TURBULENCE / CAT/ DETECTION  
A67-12053



- MOELLER, G.  
TUBE DIAMETER INFLUENCE ON OUTPUT POWER AND  
EFFICIENCY OF GAS LASER A67-16629
- MOESCHWITZER, A.  
P-N JUNCTION, ELECTROMAGNETIC WAVES OF GALLIUM  
ARSENIDE SEMICONDUCTOR LASER  
FTD-TT-65-891/162&4 N66-30510
- MOGILEVSKII, E. I.  
LASER CHARACTERISTICS OF NARROW BAND TYPE I SOLAR  
RADIO BURST AND MAGNETIC DIPOLE TRANSITIONS IN  
SPLIT ZEEMAN SUBLEVELS OF HYDROGEN ATOMS OF  
SOLAR CORONA IN GROUND LEVEL A67-11652
- MOHN, E.  
POLARIZATION OF PULSED RADIATION FROM GaAs LASER  
DIODE TO DETERMINE ORIGIN OF NATURAL OSCILLATIONS  
OF RESONATOR A66-37549
- MOORE, J. S.  
SYNTHESIS, JUNCTION FABRICATION, AND LUMINESCENT  
OPERATION OF GALLIUM-ARSENIDE-PHOSPHIDE  
SEMICONDUCTORS  
AFCRL-66-245 N66-36868
- JUNCTION EFFECTS IN COMPOUND SEMICONDUCTORS  
AFCRL-66-617 N67-15074
- MORAEI-COURTOIS, N.  
TOPOCENTRIC DISTANCE OF GEODETIC SATELLITE GEOS-  
A MEASURED BY LASER TELEMETRY FROM STATION  
A66-30586
- MOREHEAD, F. F.  
SEMICONDUCTOR INJECTION LASERS  
REPT.-8 N66-27687
- MORGAN, J.  
GRANULARITY CHARACTERISTICS OF SCATTERED LIGHT  
FROM HELIUM-NEON LASER DIRECTED ONTO MOVING  
SURFACE A66-31725
- MORGENSTERN, Z. L.  
RUBY PHOSPHORESCENCE UNDER INTENSE OPTICAL  
EXCITATION, INFERRING POSSIBLE RECOMBINATION  
CHARACTERISTICS FROM INITIAL BRIGHTNESS DECAY  
A66-28607
- SPECTRAL DISTRIBUTION OF RUBY LUMINESCENCE YIELD,  
NOTING ABSORPTION COEFFICIENT AND EXCITATION  
BAND A66-33509
- SPECTRAL DISTRIBUTION OF RUBY LUMINESCENCE YIELD,  
NOTING ABSORPTION COEFFICIENT AND EXCITATION BAND  
A66-42123
- MORITA, H.  
NONLINEAR QUANTUM EFFECT IN SOLID STATE LASERS  
USING PARAMAGNETIC CRYSTALS, NOTING RAMAN EFFECT  
AND GAIN DEPENDENCE ON PUMPING POWER  
A66-26172
- MOROSOV, V. N.  
EQUATION FOR DYNAMICAL BEHAVIOR OF LASER, SOLVING  
CASE OF DEEP MODULATION OF OUTPUT, NOTING  
PULSATION PROBLEMS A67-16662
- MOROZOV, V. N.  
TRAVELING WAVE BEATS CREATED BY RING LASER ON  
ROTATING PLATFORM, NOTING FREQUENCY DIVISION  
ROTATING RATE AND CAPTURE BAND PARAMETERS  
A66-25102
- PERIODIC UNDAMPED OSCILLATIONS IN POWER INTENSITY  
OF TWO-MODE OPTICAL MASER A66-26217
- TRAVELING WAVE BEATS CREATED BY RING LASER ON  
ROTATING PLATFORM, NOTING FREQUENCY DIVISION  
ROTATING RATE AND CAPTURE BAND PARAMETERS  
A66-30281
- MODE CHARACTERISTICS OF SOLID STATE LASERS FROM  
ANALYTICAL SOLUTION OF CONSERVATIVE EQUATION  
A66-33839
- NONLINEAR INTERACTION OF OSCILLATIONS OF TWO TYPES  
IN LASER DOES NOT EFFECT STATIONARY OPERATION WHEN  
OSCILLATIONS ARE SUFFICIENTLY APART IN BAND
- A66-37661
- STABLE LIMITING CYCLES OF LASER RESULTING FROM  
MUTUAL SYNCHRONIZATION OF PHASE-SHIFTED  
OSCILLATION MODES A66-39653
- SPONTANEOUS EMISSION IN INVERSELY POPULATED MEDIUM  
EXAMINED FOR UNIFORM RUBY ROD LASER WITH UNIFORM  
PUMPING DISTRIBUTION A66-41450
- OSCILLATION FREQUENCY OF MASER OSCILLATOR  
CALCULATED USING PERTURBATION THEORY, NOTING  
TRAVELING WAVE EFFECT A67-10395
- MODE CHARACTERISTICS OF SOLID STATE LASERS FROM  
ANALYTICAL SOLUTION OF CONSERVATIVE EQUATION  
A67-13208
- SPONTANEOUS EMISSION IN INVERSELY POPULATED MEDIUM  
EXAMINED FOR UNIFORM RUBY ROD LASER WITH UNIFORM  
PUMPING DISTRIBUTION A67-14186
- MORROW, H. E.  
THREE-DIMENSIONAL HOLOGRAPHY  
NEL-1403 N67-16644
- MOSER, J.-F.  
LASER EMISSION INTERFEROGRAMS OBTAINED WITH  
FABRY-PEROT CROSS-GRATING INTERFEROMETER IN  
SUBMILLIMETER WAVELENGTH RANGE A66-37546
- SUBMILLIMETER LASER EMISSION FROM ICN NOTING  
INTERFEROGRAMS A66-37547
- MOSS, E. B.  
ACQUISITION AND REACQUISITION IN SPACECRAFT-  
SPACECRAFT AND SPACECRAFT-TO-EARTH COMMUNICATIONS  
USING LASER SYSTEMS A66-33795
- MOSS, T. S.  
SPONTANEOUS EMISSION AND TRANSVERSE GAIN  
MEASUREMENTS IN GaAs INJECTION LASER AT 80  
DEGREES K AND FOR 8466 ANGSTROM WAVELENGTH  
A66-28627
- ENERGY AND POWER OF Q-SWITCHED NEODYMIUM GLASS  
LASER MEASURED, USING CALORIMETRIC DEVICES,  
VACUUM PHOTODIODES, ETC A66-34904
- TRANSVERSE GAIN AND SPONTANEOUS AND STIMULATED  
EMISSION AT 8466 ANGSTROMS IN GaAs STRUCTURES  
A66-42561
- MOVSESIAN, M. E.  
SPECTRAL AND TIME-DEPENDENT CHARACTERISTICS OF  
STIMULATED RADIATION FROM RUBY PULSE LASER, USING  
FABRY-PEROT ETALON IN FINE-STRUCTURE OBSERVATION  
A66-39823
- MOVSESIAN, M. E.  
TEMPERATURE DEPENDENCE OF FLUORESCENT FREQUENCY  
SHIFT IN RUBY LASER  
FTD-TT-65-2006 N67-10978
- MOZHHERIN, V. F.  
DESCRIPTION OF RUBY LASER USED IN OPTICAL LOCATION  
OF MOON  
NASA-TT-F-8866 N66-29428
- MOZHHERIN, V. M.  
MEASUREMENT OF DISTANCE TO MOON BY OPTICAL  
RADAR, DISCUSSING RUBY LASER/PHOTOMULTIPLIER  
APPARATUS AND PROCEDURE A66-30291
- LUNAR FIGURE AND ORBIT PARAMETERS MEASURED BY  
OPTICAL LOCATION METHOD A66-35285
- PROZIEWICZ, B.  
GALLIUM ARSENIDE LASER DESIGN USING P-N JUNCTION  
OBTAINED BY DIFFUSION OF ZINC IN TELLURIUM DOPED  
N-GaAs SINGLE CRYSTAL A66-29057
- MUELLER, R. K.  
HYPERSONIC EXCITATIONS DUE TO BRILLOUIN  
SCATTERING FOR CASE WITH STOKES FEEDBACK,  
DERIVING QUANTUM EQUATION OF MOTION FOR CREATION  
OF LASER AND STOKES MODES AND COUPLED ACOUSTIC  
MODE A67-16683

- MULDOON, H.  
PHASE-LOCKING SCHEME FOR FREQUENCY-STABILIZED  
GAS LASER OSCILLATORS  
NASA-CR-80958 N67-14893
- MULLER, W. M.  
MARK I SMASER DESIGN, SUBMILLIMETER WAVE GAS  
LASER CAPABLE OF CONTINUOUS WAVE OR PULSE  
OPERATION A66-29009
- MUMINOV, R. A.  
COHERENT RADIATION GENERATION IN ELECTRON-HOLE  
INDIUM ANTIMONIDE PLASMA, DISCUSSING EMISSION  
SPECTRUM A66-40319
- SPONTANEOUS AND INDUCED COHERENT RADIATION FROM  
INDIUM ANTIMONIDE ELECTRON-HOLE PLASMA A67-10088
- MUNICK, R. A.  
DOPPLER LASER RADAR SYSTEM FOR DETECTION OF CLEAR  
AIR TURBULENCE  
SID-66-450 N66-35122
- MURAMOTO, M.  
CHEMICAL PUMPED UV LASER ACTION THROUGH THERMAL  
DECOMPOSITION OF DIMETHYL PEROXIDE A66-28836
- MURINA, T. M.  
LASER REGIME WITH GIANT PULSES GENERATED IN  
DYSPROSIUM DOPED CADMIUM FLUORIDE UNDER CONTINUOUS  
PUMPING BY XENON LAMPS, OBTAINING Q FACTOR  
MODULATION BY ROTATING PRISM A66-34178
- DYSPROSIUM DOPED CALCIUM FLUORIDE GIANT PULSE  
LASER WITH HIGH REPETITION RATE OBTAINED, USING  
DC PUMPING XENON LAMP A67-16674
- MURPHY, W. F.  
C W HE- NE LASER COMPARED WITH MERCURY ARC  
SOURCE, OBTAINING RAMAN SPECTRA OF CARBON  
TETRACHLORIDE BY THREE METHODS OF EXCITATION  
A67-13912
- MURRAY, D. H.  
SENSITIVITY OF OPTICAL SYSTEM USED IN SCHLIEREN  
SETUP IN DETERMINING QUALITY OF RECORDED  
INFORMATION A67-14606
- MURRAY, G. T.  
ELECTRON BEAM MELTING AND FLOAT ZONE CRYSTAL  
GROWTH TECHNIQUES FOR PROCESSING ALUMINUM OXIDE  
AND RELATED MATERIALS USED IN LASER TECHNOLOGY  
AFCLR-66-473 N67-10948
- MURTY, M. V. R. K.  
LATERAL SHEARING INTERFEROMETER WITH GAS-LASER  
LIGHT SOURCE FOR TESTING LARGE OPTICAL SYSTEMS  
A66-27320
- MUSHRUSH, G. W.  
FLUORESCENCE QUANTUM EFFICIENCIES OF OCTA-  
COORDINATED EUROPIUM HOMOGENEOUS AND MIXED  
CHELATES IN ORGANIC SOLVENTS, NOTING EFFECT OF  
OXYGEN REMOVAL A66-41153
- MUSTEL, E. R.  
INTERNAL MODULATION OF IR GAS LASER USING  
CADMIUM SULFIDE OR SELENIDE SINGLE CRYSTALS  
A67-16914
- MYER, J. H.  
MODULAR LIQUID-COOLED CYLINDRICAL RUBY LASER  
MICROWELDER DESIGN AND CONSTRUCTION A67-15310
- MYERS, R. A.  
ELECTRON-BEAM-CONTROLLED CRT SCANLASER A66-25557
- ELECTRON BEAM SCANLASER BASED ON LASER CAVITY  
DIRECTLY AND/OR TRANSVERSELY DEGENERATE HAVING Q-  
SPOILED FOR ALL MODES BUT ONE A66-38244
- WIDE FIELD ACTIVE IMAGING, IMAGE PROCESSING IN  
WHICH PICTORIAL INFORMATION IS PLACED WITHIN LASER  
CAVITY A66-42559
- MYERS, W. C.  
THERMAL HIGH RESOLUTION RECORDING USING MOVING  
LASER SPOT ON METALLIC AND ORGANIC THIN FILMS  
A67-16586
- MYSYROWICZ, A.  
LUMINESCENCE SPECTRUM OF CU CL AT LOW  
TEMPERATURES EXCITED BY DOUBLE PHOTON ABSORPTION  
FROM HIGH INTENSITY LASER BEAM A67-17822
- ## N
- NABOIKIN, I. V.  
EMISSION LOSSES IN SOLID STATE LASER RESONATOR  
CALCULATED FOR ND GLASS LASER A67-13133
- NAIMAN, C. S.  
ABSORPTION BEHAVIOR OF OPTICALLY PUMPED RUBY ROD,  
NOTING AMPLIFICATION AT ROOM TEMPERATURE AND  
ABSORPTION AT CRYOGENIC TEMPERATURE A66-26174
- FERROELECTRIC MATERIALS FOR LIGAND FIELD MASER  
IN MILLIMETER RANGE - LIGAND FIELD NEAR GROUND  
STATE CROSSEOVERS MEASURED BY OPTICAL AND  
MICROWAVE SPECTROSCOPY  
MC-64-102-R2 N66-39741
- NAJAC, H. M.  
EFFECTS OF RUBY LASER RADIATION ON OCULAR TISSUE  
OF RABBITS AND ESTIMATION OF HUMAN CORNEAL  
THRESHOLD  
FA-R-1815 N67-10968
- NAKAI, S.  
BEAM SCATTERING, INTERFEROMETRY, AND NONLINEAR GAS  
EFFECT STUDIES IN GASEOUS MATTER-LASER BEAM  
INTERACTION EXPERIMENTS  
REPT.-662 N66-37871
- NAKATA, M. M.  
RUBY LASER AS ENERGY SOURCE FOR MEASURING  
THERMOPHYSICAL PROPERTIES OF MATERIALS VIA FLASH  
TECHNIQUE A67-15305
- NAKAYA, T.  
DEPOPULATION OF GROUND STATE CHROMIUM IONS IN RUBY  
UNDER OPTICAL PUMPING EXPLAINED VIA RATE EQUATIONS  
A66-25188
- NAMBA, S.  
ENERGIES OF IONS GENERATED FROM METAL SURFACE  
IRRADIATED BY SINGLE GIANT PULSE LASER A66-38412
- NANNICHI, Y.  
GAIN FACTOR VARIATION WITH THRESHOLD CURRENT IN  
REFLECTIVE AND ANTIREFLECTIVE FILMS OF GA AS  
LASER WITH PHOTON AND CURRENT DENSITIES A66-38388
- NAQUET, R.  
LOCALIZED DEEP BRAIN TISSUE LESIONS IN CATS BY  
LASER ENERGY A66-81895
- NARAY, ZS.  
HIGH POWER LASER BEAM POLARIZATION DIRECTION  
EFFECTS ON ELECTRON EMISSION FROM AG SURFACE  
A67-18759
- NARCHAL, M. L.  
TRANSIENTS AND STABILITY OF IDEALIZED TWO-LEVEL  
LASER SYSTEM, OBTAINING RATE EQUATION SOLUTION,  
NOTING CHARACTERIZATION BY RELAXATION TIMES  
A66-41034
- NASHELSKII, A. IA.  
COHERENT EMISSION OF INDIUM ARSENIDE PHOSPHIDE P-N  
JUNCTION A66-31788
- INDIUM PHOSPHIDE BASED SEMICONDUCTOR LASER  
AMPLIFICATION, LOSS FACTOR AND RADIATION PATTERN  
A67-10065
- COHERENT EMISSION OF INDIUM ARSENIDE PHOSPHIDE P-N  
JUNCTION A67-10101
- NASLEDOV, D. N.  
RECOMBINATION RADIATION FROM GA AS P-N

- JUNCTIONS WITH AND WITHOUT FABRY-PEROT RESONATOR, NOTING PARAMETER DEPENDENCE ON CURRENT DENSITY A66-40314
- VOLT-AMPERE CHARACTERISTICS AND OTHER PROPERTIES OF GaAs LASERS WITH TELLURIUM AND ZN-DOPED EPITAXIAL P-N JUNCTION A67-10080
- CONTINUOUS COHERENT RADIATION OF GaAs SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT AMBIENT TEMPERATURE OF 77 DEGREES K A67-10548
- CONTINUOUS COHERENT RADIATION OF GaAs SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT AMBIENT TEMPERATURE OF 77 DEGREES K A67-11056
- I-V CHARACTERISTIC OF GaAs DIODE WITH FABRY-PEROT RESONATOR, NOTING VARIATIONS DURING AMPLIFICATION TO GENERATION TRANSITION A67-15132
- RECOMBINATION RADIATION OF P-N JUNCTIONS IN GaAs WITH AND WITHOUT FABRY-PEROT CAVITY, DISCUSSING NONEQUILIBRIUM CURRENT CARRIER KINETICS AND I-V CHARACTERISTICS A67-18934
- NATHAN, A.  
THERMALLY TUNED RUBY LASER RADAR FOR DETERMINING VERTICAL PROFILE OF ATMOSPHERIC WATER VAPOR TR-66-9 N66-35539
- NATHAN, M. I.  
SEMICONDUCTOR LASER TECHNOLOGY, OPERATING PRINCIPLES, MATERIAL PROPERTIES AND PERFORMANCE, WITH EMPHASIS ON GaAs JUNCTION LASERS A66-42802
- NAUMOVA, L. V.  
OSCILLATION TYPES FOR GAS-LASER SEMICONCENTRIC RESONATOR A66-28160
- OSCILLATION TYPES FOR GAS-LASER SEMICONCENTRIC RESONATOR A67-13286
- NAZAROV, V. P.  
CRYSTAL MOTION EFFECT ON TIME BEHAVIOR OF LASER GENERATION MODE, USING HIGH SPEED PHOTOGRAPHY AND OSCILLOGRAMS A66-29725
- NEELAND, J. K.  
PULSED RUBY LASERS, CONSIDERING PUMPING AND THRESHOLD, OUTPUT, QUANTUM MECHANICS AND VARIATION ON BASIC DEVICE A66-36968
- OUTPUT SPECTRA OF Nd DOPED YAG AND RUBY LASERS, DETERMINING MECHANISMS RESPONSIBLE FOR OBSERVED OVERALL LINEWIDTHS A67-16660
- NEHRICH, R. B.  
RECIRCULATION OF LIQUID THROUGH CELL AND EXTERNAL HEAT EXCHANGER TO SOLVE PROBLEM OF REPEATED FLASHING IN EUROPIUM CHELATE LASERS A66-39108
- NELLES, M.  
LASER, ELECTRON AND PLASMA ENERGY BEAM TYPES AND APPLICATION TO MANUFACTURING TECHNOLOGY A67-12179
- NELSON, P.  
MULTIPHOTON PROCESSES DUE TO LASER ACTION - CRITICAL INTENSITY CHARACTERISTICS, COMPTON SCATTERING, BREMSSTRAHLUNG, PHOTOELECTRIC EFFECT, AND ELIMINATION OF INFRARED DIVERGENCE CEA-R-2888 N66-29032
- NEMCHINOV, I. V.  
LASER RADIATION EFFECT ON HEATING PROCESS AND GAS DYNAMIC MOTION OF FINITE TRANSPARENT GAS AND MOTIONLESS COLD GAS AT VACUUM INTERFACE A67-17008
- CLEAVAGE AND SEPARATION OF DYE-DOPED ICE AND PARAFFIN INSTANTANEOUSLY HEATED BY LASER PULSE, MEASURING MECHANICAL PULSE AT ENERGY CONCENTRATIONS BELOW VAPORIZATION HEAT A67-18807
- NESOR, H. R.  
ELECTRON BEAM MELTING AND FLOAT ZONE CRYSTAL GROWTH TECHNIQUES FOR PROCESSING ALUMINUM OXIDE AND RELATED MATERIALS USED IN LASER TECHNOLOGY AFCRL-66-473 N67-10948
- NEUSEL, R. H.  
GAS PUMPING EFFECT ON OUTPUT OF REPETITIVELY PULSED ION LASERS A66-42569
- NEUSTRUEV, V. B.  
RUBY PHOSPHORESCENCE UNDER INTENSE OPTICAL EXCITATION, INFERRING POSSIBLE RECOMBINATION CHARACTERISTICS FROM INITIAL BRIGHTNESS DECAY A66-28607
- NEUSTRUEV, V. V.  
SPECTRAL DISTRIBUTION OF RUBY LUMINESCENCE YIELD, NOTING ABSORPTION COEFFICIENT AND EXCITATION BAND A66-33509
- SPECTRAL DISTRIBUTION OF RUBY LUMINESCENCE YIELD, NOTING ABSORPTION COEFFICIENT AND EXCITATION BAND A66-42123
- NEVE, N. F. B.  
SCANNING ELECTRON MICROSCOPE TO EXAMINE CRYSTAL MOSAIC STRUCTURES AND LASING PROPERTIES OF GALLIUM ARSENIDE LASER DIODES A66-33300
- NICASTRO, L. J.  
LASER RADIATION TO DETERMINE ELECTRON DENSITY IN DENSE HIGH TEMPERATURE PLASMA A66-27507
- LASER MEASUREMENT OF ELECTRON DENSITY IN DENSE, HIGH TEMPERATURE PLASMA N67-13686
- NICHOLSON, A. N.  
CHORIORETINAL LESION PRODUCED BY PULSED RUBY LASER BEAM AND COMPLEX CHANGES IN RETINAL EXCITABILITY IN CATS A66-31761
- LASER LESIONS-CHANGES IN RETINAL EXCITABILITY IN CATS A66-81614
- NICKLE, H. H.  
TIME DEPENDENT SCHROEDINGER EQUATION FOR BLOCH ELECTRON IN PRESENCE OF LASER FIELD, USING WKB APPROXIMATION METHOD, COMPARED WITH PERTURBATION THEORY A66-41266
- NICOLL, F. H.  
PULSED OPERATION OF ELECTRON-BEAM PUMPED ZINC OXIDE LASER EMITTING RADIATION IN UV AT VERY LOW TEMPERATURES, NOTING IMPORTANCE OF USE OF CAVITY A66-37768
- FAR FIELD PATTERN OF SHEET-LIKE LASER BEAM FROM ELECTRON BOMBARDED CdS AND ZnO SINGLE CRYSTALS A67-19798
- NIKITIN, A. I.  
HYDROGEN ATOM BEAM CHARACTERISTICS, DISCUSSING SIGNAL POWER, GENERATING FREQUENCY, RADIATION SIGNAL DAMPING AND HYDROGEN ATOM RELAXATION TIME A66-28289
- AMPLITUDE AND FREQUENCY CHARACTERISTICS OF HYDROGEN-ATOM BEAM MASER A67-11574
- NIKITIN, V. V.  
GALLIUM ARSENIDE P-N JUNCTION LASER DIODE, INJECTION CURRENT DISTRIBUTION, DENSITY AND EMISSION SPECTRA VARIATION A66-25934
- OPTICALLY CONNECTED LASER CONSTRUCTED ON GALLIUM ARSENIDE P-N JUNCTION, NOTING COHERENT RADIATION A66-28262
- INDIUM ARSENIC ANTIMONIDE SINGLE CRYSTALS IN P-N JUNCTION LASER A66-31767
- OPTICAL COUPLING USING GALLIUM ARSENIDE LASER FOR VARIATION OF FREQUENCY OF DIODE EMISSION THROUGH SMALL CHANGE IN CURRENT DENSITY A66-38920
- CURRENT INJECTION EFFECT ON TIME DELAY OF GaAs LASER RADIATION A67-10083

- INDIUM ARSENIC ANTIMONIDE SINGLE CRYSTALS IN P-N JUNCTION LASER A67-10087 A66-26202
- OPTICAL COUPLING USING GALLIUM ARSENIDE LASER FOR VARIATION OF FREQUENCY OF DIODE EMISSION THROUGH SMALL CHANGE IN CURRENT DENSITY A67-16390
- NIKITINA, T. F.  
HYDROGEN ATOM BEAM CHARACTERISTICS, DISCUSSING SIGNAL POWER, GENERATING FREQUENCY, RADIATION SIGNAL DAMPING AND HYDROGEN ATOM RELAXATION TIME A66-28289
- GALLIUM ARSENIDE LASERS OPERATING AT ROOM TEMPERATURE INVESTIGATED, BASED ON DIFFUSION P-N JUNCTIONS, DISCUSSING EMISSION SPECTRUM A66-36070
- VOLT-AMPERE CHARACTERISTICS AND OTHER PROPERTIES OF GA AS LASERS WITH TELLURIUM AND ZN-DOPED EPITAXIAL P-N JUNCTION A67-10080
- CONTINUOUS COHERENT RADIATION OF GA AS SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT AMBIENT TEMPERATURE OF 77 DEGREES K A67-10548
- CONTINUOUS COHERENT RADIATION OF GA AS SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT AMBIENT TEMPERATURE OF 77 DEGREES K A67-11056
- NIKITINE, S.  
LUMINESCENCE SPECTRUM OF CU CL AT LOW TEMPERATURES EXCITED BY DOUBLE PHOTON ABSORPTION FROM HIGH INTENSITY LASER BEAM A67-17822
- NISHIDA, K.  
CRYSTAL DEFECTS AND PERFORMANCE IN RUBY LASER, MEASURING COHERENCE FUNCTION OF LIGHT AND OUTPUT ENERGY AND CRYSTAL HOMOGENEITY A66-41291
- NIXON, W. M.  
FERRIC-DOPED-RUTILE 8 MM TRAVELING WAVE MASER, NOTING OPERATING RANGE AND PERFORMANCE CHARACTERISTICS A67-13986
- NIZHEGORODOVA, I. V.  
RUBY LASER WITH LIQUID FILTER, CONSIDERING RELATION BETWEEN FILTER EFFICIENCY AND ABSORPTION CURVE PARAMETERS WHEN ACTING AS Q-FACTOR MODULATOR A67-12423
- NODWELL, R. A.  
SCATTERING OF LIGHT FROM PULSED RUBY LASER BY PLASMA JET, NOTING CROSS SECTION, ELECTRON-PHONON INTERACTION, ETC A66-30139
- NOLLE, E. L.  
FORCED EMISSION FROM ELECTRON-EXCITED CADMIUM SELENIDE A66-35788
- NORTH, W. P.  
LASER FOR PHOTOELASTICITY INCLUDING SCATTERED-LIGHT METHOD, CONVENTIONAL TRANSMISSION POLARISCOPE WITH STATIC LOADS AND DYNAMIC PHOTOELASTICITY A66-32072
- NORTH, W. P. T.  
DYNAMIC PHOTOELASTICITY MEASUREMENTS OF STRESS CONCENTRATION, USING RUBY LASER MONOCHROMATIC LIGHT SOURCE A66-34557
- NORTHEND, C. A.  
HIGH POWERED Q-SWITCHED RUBY LASER / LIDAR/ FOR METEOROLOGICAL APPLICATION, NOTING SYSTEM EQUATIONS, DESIGN, OPERATION, ETC A66-26548
- NOVICK, R.  
HE-NE LASER HOMODYNE SPECTROMETER OBSERVATION OF BROADENING OF SPECTRAL PROFILE OF LIGHT SCATTERED FROM CARBON DIOXIDE NEAR CRITICAL TEMPERATURE AND DENSITY DUE TO DENSITY FLUCTUATIONS A66-26168
- LIGHT SHIFT, LIGHT MODULATION AND PHASE PULLING IN OPTICALLY PUMPED RUBIDIUM MASER
- NOVIKOV, N. P.  
CHANGES IN GIANT MOLECULE STRUCTURE OF POLYPROPYLENE FILMS UNDER ACTION OF LASER PULSES ANALYZED BY OPTICAL MICROSCOPY A67-19169
- NOVIKOVA, L. A.  
GAS LASER OUTPUT AND THRESHOLD IN POPULATION INVERSION FROM PHOTODISSOCIATION OF METHYL IODIDE AND FLUOROIODO METHYLIDYNE A66-35368
- NOVOTNY, H. R. F.  
HYPERVELOCITY IMPACT TESTS ON ALUMINUM TARGET PLATES TO EVALUATE MICROMETEOROID IMPACT SENSORS - LASER SIMULATION STUDY NASA-CR-76102 N66-30173
- NOWICKI, M.  
NEODYMIUM DOPED OPTICAL GLASSES FOR LASER TECHNOLOGY A67-16855
- NOYORI, K. S.  
RETINAL LESIONS PRODUCED BY RUBY LASER IN RABBITS AND HUMANS A66-82224
- NUESE, C. J.  
CRYSTAL GROWTH, DIFFUSION AND FABRICATION OF GALLIUM ARSENIDE-PHOSPHIDE JUNCTION LASERS WITH LOW THRESHOLD CURRENT DENSITIES A66-37401
- SYNTHESIS, JUNCTION FABRICATION, AND LUMINESCENT OPERATION OF GALLIUM-ARSENIDE-PHOSPHIDE SEMICONDUCTORS A67-16855 N66-36868
- NUGENT, L. J.  
DETECTING CONCENTRATION OF NITRIC OXIDE IN METASTABLE STATE IN UPPER ATMOSPHERE, USING GIANT-PULSE RAMAN LASER SOURCES A66-43022
- VELOCITY ABERRATION AND ATMOSPHERIC REFRACTION PERTAINING TO LASER SATELLITE COMMUNICATION EXPERIMENTS, OBTAINING EQUATIONS FOR ESTIMATION OF EFFECTS A67-12054
- NUNEZ, J.  
C W IR LASER OSCILLATION IN ATOMIC CL IN H CL AND HI GAS DISCHARGES, NOTING USE OF TWO POWER SUPPLIES AND ENERGY LEVEL DIAGRAM A66-28880
- NUNICK, R. J.  
PROGRAM PLANNING, GROUND SUPPORT AND AIRBORNE EQUIPMENT FOR LASER SPACE COMMUNICATION SYSTEM NASA-CR-78855 N66-39446
- CBREIMOV, I. V.  
GAS LASER AS SOURCE OF ILLUMINATION, WITH ATTENTION TO ORIGIN OF AVENTURINE SPOTS ON SCREEN A67-19142
- OBRIEN, R. N.  
QUALITATIVE RESULTS ON TRANSPORT MECHANISMS AROUND DROPPING MERCURY ELECTRODE, USING LONG PATH LASER INTERFEROMETRY A66-33924
- O'CONNOR, J. R.  
MEASUREMENTS ON PHYSICAL AND LASER PROPERTIES OF VAPOR-GROWN RUBY SINGLE CRYSTALS PREPARED BY EPITAXIAL GROWTH A66-36081
- SPECTRAL PROPERTIES OF ND DOPED YTTRIUM VANADATE GROWN FROM MELT, NOTING REDUCED STARK SPLITTING LEADING TO LASER ACTION A67-19559
- ODINTSOV, A. I.  
REGENERATIVE HELIUM-NEON LASER WITH AMPLIFICATION COEFFICIENT OF 1000 A66-29352
- REGENERATIVE HELIUM-NEON LASER WITH AMPLIFICATION COEFFICIENT OF 1000 A66-37357
- RESONATOR MISALIGNMENT EFFECT ON OUTPUT OF NEON-HELIUM LASER WITH SPHERICAL MIRRORS A66-41830

- OGUCHI, H.  
HIGH TEMPERATURE FLOW CHARACTERISTICS IN FREE  
PISTON SHOCK TUBE MEASURED BY MEANS OF PULSED  
LIGHT OF HE- NE GAS LASER A66-35353
- OHI, M.  
TRANSIENT BEHAVIOR OF HE- NE LASERS UNDER PULSED  
HF EXCITATION, DISCUSSING RATE EQUATIONS  
REPRESENTING ATOMIC POPULATION DENSITY AND PHOTON  
DENSITY A67-16980
- OHLMANN, R. C.  
EXCITATION RADIATION TRANSFER FROM TRIVALENT  
CHROMIUM TO NEODYMIUM EXAMINED VIA FLUORESCENCE  
SPECTROSCOPY, NOTING ENERGY TRANSFER PARAMETERS  
AND EFFECT ON LASER OUTPUT A66-26175
- ALIGNMENT OF ANGULAR POSITIONS OF SPHERICAL MIRROR  
AND GRATING OF FASTIE- EBERT SPECTROMETER, USING  
BRIGHT COLLIMATED MONOCHROMATIC BEAM OF HE- NE  
LASER A66-26564
- OHNO, Y.  
CURRENT MEASURING DEVICE FOR EHV TRANSMISSION  
LINE, OBTAINING INSTANTANEOUS MAGNETIC FIELD BY  
GAUGING FARADAY ROTATION ANGLE OF LASER BEAM IN  
FLINT GLASS ROD A66-42556
- OHTSUKA, Y.  
CAVITY LOSS AND OPTIMUM REFLECTIVITY OF OUTPUT  
MIRROR IN RUBY LASER WITH EXTERNAL MIRROR A66-25187
- OKWIT, S.  
ULTRALOW-NOISE TUNABLE S-BAND AMPLIFIER USING  
TWM AS SECOND STAGE A67-10106
- ONEAL, W. C.  
MULTIGIGAWATT OSCILLATOR-AMPLIFIER RUBY LASER  
SYSTEM FOR HIGH TEMPERATURE PLASMA RESEARCH  
ASME PAPER 66-WA/ENER-2 A67-15371
- OPPOWER, H.  
ENERGY-RICH PLASMAS PRODUCED BY LIGHT PULSES FROM  
Q-SWITCHED LASER, NOTING ENERGY TRANSFER FROM  
ELECTRONS TO IONS DURING EXPANSION PROCESS A66-27607
- OPPENHEIM, A. K.  
OPTICAL SYSTEM FOR SCHLIEREN RECORDING, DEFLECTION  
MAPPING, SHADOWGRAPHY AND INTERFEROMETRY ACHIEVED  
FOR LASER LIGHT, USED IN RECORDING OF REFRACTIVE  
INDEX FIELDS A66-26307
- HIGH SPEED STROBOSCOPIC PHOTOGRAPHY USING KERR  
CELL MODULATED LASER SOURCE A66-30828
- TRANSITION TO DETONATION IN GASEOUS MEDIUM  
EXPERIMENTALLY STUDIED, BASED ON SELF-SUSTAINED  
DETONATION FRONT AND ADAPTATION OF AMPLITUDE  
MODULATED GIANT PULSE LASER SYSTEM A67-13500
- ORAEVSKII, A. I.  
HIGH FREQUENCY-STABILITY EM WAVE SOURCE, APPLYING  
THERMAL EXCITATION METHODS TO PENCIL QUANTUM  
GENERATOR IN IR REGION A66-39336
- HIGH FREQUENCY-STABILITY EM WAVE SOURCE, APPLYING  
THERMAL EXCITATION METHODS TO PENCIL QUANTUM  
GENERATOR IN IR REGION A66-39706
- ORAEVSKII, A. N.  
TRAVELING WAVE BEATS CREATED BY RING LASER ON  
ROTATING PLATFORM, NOTING FREQUENCY DIVISION  
ROTATING RATE AND CAPTURE BAND PARAMETERS A66-25102
- NATURAL MODES OF PLANE AND CYLINDRICAL DIELECTRIC  
RESONATORS IN OPTICAL BAND A66-26042
- TRAVELING WAVE BEATS CREATED BY RING LASER ON  
ROTATING PLATFORM, NOTING FREQUENCY DIVISION  
ROTATING RATE AND CAPTURE BAND PARAMETERS A66-30281
- LASER MODE OPERATION IN PRESSURE OF RADIATION  
ABSORBING IMPURITY ANALYZED BY EXTENDED THOMSON  
TYPE SYSTEM A66-31558
- MODE CHARACTERISTICS OF SOLID STATE LASERS FROM  
ANALYTICAL SOLUTION OF CONSERVATIVE EQUATION A66-33839
- TWO-LASER CAVITY IN TANDEM TO RESOLVE COMPONENTS  
WITH HOMOGENEOUSLY BROADENED / DOPPLER/ LINE A66-36720
- NONLINEAR INTERACTION OF OSCILLATIONS OF TWO TYPES  
IN LASER DOES NOT EFFECT STATIONARY OPERATION WHEN  
OSCILLATIONS ARE SUFFICIENTLY APART IN BAND A66-37661
- STABLE LIMITING CYCLES OF LASER RESULTING FROM  
MUTUAL SYNCHRONIZATION OF PHASE-SHIFTED  
OSCILLATION MODES A66-39653
- OSCILLATION FREQUENCY OF MASER OSCILLATOR  
CALCULATED USING PERTURBATION THEORY, NOTING  
TRAVELING WAVE EFFECT A67-10395
- MODE CHARACTERISTICS OF SOLID STATE LASERS FROM  
ANALYTICAL SOLUTION OF CONSERVATIVE EQUATION A67-13208
- EQUATION FOR DYNAMICAL BEHAVIOR OF LASER, SOLVING  
CASE OF DEEP MODULATION OF OUTPUT, NOTING  
PULSATION PROBLEMS A67-16662
- ORAEVSKII, I. N.  
THRESHOLD AND POWER CHARACTERISTICS OF GALLIUM  
ARSENIDE DIODE LASER OPERATING IN PULSED REGIME A67-10066
- CONTINUOUS COHERENT RADIATION OF GA AS  
SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT  
AMBIENT TEMPERATURE OF 77 DEGREES K A67-10548
- CONTINUOUS COHERENT RADIATION OF GA AS  
SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT  
AMBIENT TEMPERATURE OF 77 DEGREES K A67-11056
- ORAEVSKY, A. N.  
PERIODIC UNDAMPED OSCILLATIONS IN POWER INTENSITY  
OF TWO-MODE OPTICAL MASER A66-26217
- ORAEVSKIY, A. I.  
THERMALLY EXCITED INFRARED BEAM LASER USING  
CARBON DIOXIDE, NITROGEN OXIDE, AND HYDROCYANIC  
ACID MOLECULAR ENERGY LEVELS A67-15769
- ORSZAG, A.  
FREQUENCY SHIFT RELATIVE TO SPECTRAL WIDTH FOR  
SINGLE PULSES OF TRIGGERED LASER DETERMINED BY  
MEASURING VARIATIONS OF EMITTED WAVELENGTH AS  
FUNCTION OF TIME A66-32622
- DENSITY AND TEMPERATURE OF UPPER ATMOSPHERE,  
SATELLITE TRACKING, GEODETIC APPLICATIONS AND LONG  
DISTANCE MEASUREMENTS, USING LASER OUTPUT A67-17591
- OSIKO, V. V.  
CALCIUM FLUORIDE-CERIUM FLUORIDE WITH NEODYMIUM  
ADDITIONS AS ACTIVE MEDIUM FOR LASERS, DISCUSSING  
ABSORPTION AND LUMINESCENCE SPECTRA AND INDUCED  
RADIATION A67-16922
- OSIPOV, I. I.  
ELECTRON TEMPERATURE IN ELECTRIC DISCHARGE  
APPLIED TO ARGON ION LASER A67-10550
- ELECTRON TEMPERATURE IN ELECTRIC DISCHARGE APPLIED  
TO ARGON ION LASER A67-11058
- ARGON DISCHARGE CHARACTERISTICS USED IN CONTINUOUS  
ACTION ION LASER FOR ANALYSIS OF INVERSION  
PRODUCTION MECHANISM A67-16680
- OSTAPCHENKO, E. P.  
HELIUM-NEON LASER ASSESSMENT AS SOURCE IN HIGH  
PRECISION RANGE MEASUREMENTS A66-35362
- OSTROVSKAIA, G. V.  
SHAPE AND DIMENSION OF SPARK ARISING DURING  
FOCUSING OF LASER EMISSION A66-29210

- SHAPE AND DIMENSION OF SPARK ARISING DURING FOCUSING OF LASER EMISSION A66-33059
- ELECTRON TEMPERATURE AND CONCENTRATION IN DC PLASMA ARC DETERMINED FROM THOMSON SCATTERING OF LASER RADIATION A66-33840
- SPECTRAL ANALYSIS OF LASER DISCHARGE IN PURE AND IMPURE HE, OBTAINING SPECTRA OF SPARK AT VARIOUS PRESSURES, DETERMINING ELECTRON CONCENTRATION AT VARIOUS STAGES A66-40946
- ELECTRON TEMPERATURE AND CONCENTRATION IN DC PLASMA ARC DETERMINED FROM THOMSON SCATTERING OF LASER RADIATION A67-13209
- OSTROVSKAIA, V. Z.**  
COHERENT EMISSION OF INDIUM ARSENIDE PHOSPHIDE P-N JUNCTION A66-31788
- COHERENT EMISSION OF INDIUM ARSENIDE PHOSPHIDE P-N JUNCTION A67-10101
- OSTROVSKII, IU. I.**  
INTERFERENTIAL METHOD OF TESTING HIGH RESOLUTION PHOTOGRAPHIC EMULSIONS, USING LASER AS LIGHT SOURCE A67-10832
- OSTROVSKII, L. A.**  
LASER OSCILLATION AND ENERGY LOSSES IN MEDIUM CONTAINING ACTIVE MOLECULES A66-26043
- SELF-MODULATION OF LASER WITH TWO-MODE RESONATOR A66-35372
- OTTO, J. L.**  
LASER OSCILLATOR STUDY OF COHERENT STIMULATED EMISSION OF IR TRANSITIONS IN RARE GASES A66-27336
- P**
- PAANANEN, R.**  
CONTINUOUS WAVE UV IONIZED GAS LASER EMISSION OVER FOUR TRANSITIONS IN NEON, KRYPTON AND ARGON A66-37771
- PAANANEN, R. A.**  
METAL WALL IONIZED ARGON LASERS, DISCUSSING USE OF WATER-COOLED QUARTZ DISCHARGE CHANNELS, CW LASERS, DEVELOPMENT OF SATISFACTORY METAL, ETC A66-25555
- IONIZED NOBLE GAS LASERS, CONSIDERING PROBLEMS AT HIGHER POWERS, ESPECIALLY THOSE OF INVERSION MECHANISM AND MAGNETIC FIELD EFFECTS A66-33767
- PACK, J. L.**  
HIGH TEMPERATURE PLASMAS PRODUCED BY Q-SWITCHED LASER BEAM FOCUSED ON ALUMINUM TARGETS TID-22928 N67-13974
- PAKHOMOV, L. N.**  
NEODYMIUM GLASS LASER TIME CHARACTERISTICS AND SPECTRAL CHANGES DURING CONVERSION TO TRAVELING WAVE LASER A67-18782
- NEODYMIUM GLASS LASER WITH SPHERICAL MIRROR RESONATOR IN STATIONARY REGIME A67-18783
- PALMIERI, L.**  
ULTRASONIC CELL WHICH MODULATES INTENSITY OF HE- NE LASER BEAM FOR COMMUNICATION OF INTELLIGENCE A66-34059
- PANKOV, J. I.**  
ORIENTATION EFFECT IN GA AS INJECTION LASERS, NOTING EMISSION CHARACTERISTICS AND STRUCTURAL SPECTRA A66-35404
- PANNACI, E.**  
ATOMIC BEAM PREPARATION TECHNIQUES FOR HYDROGEN MASER OPERATION WITH UNPOLARIZED ATOMS ECOM-2720 N66-38178
- PANTELL, R. H.**  
STIMULATED RAMAN EFFECT AND TUNABILITY OF RAMAN LASER A66-25062
- SECOND-HARMONIC ENHANCEMENT IN NONLINEAR CRYSTAL BY LOSS MODULATOR COUPLING OF PULSED RUBY LASER MODES A66-31939
- COUPLING OF ADJACENT AXIAL MODES IN EXTERNAL RAMAN RESONATOR OBSERVED AS FIRST STOKES FREQUENCY WITH BENZENE AS RAMAN MEDIUM AND Q-SWITCHED RUBY LASER AS PUMP SOURCE A66-39109
- MODE COUPLING IN RUBY LASER WITH REACTANCE PLACED WITHIN CAVITY RESONATOR WITH MODULATION FREQUENCY CLOSE TO SEPARATION OF AXIAL MODES, EXAMINING ELECTRIC FIELD ENVELOPE A66-42565
- QUENCHING OF ONE PULSED RUBY LASER OSCILLATION BY ANOTHER, NOTING COUPLED RATE EQUATIONS FOR STEADY STATE AND TRANSIENT BEHAVIOR A67-16682
- PAPOLAR, R.**  
NONLINEAR DIELECTRIC LASER LIGHT ABSORPTION BY NEUTRAL GAS RESULTING IN AVALANCHE BREAKDOWN OF GAS DUE TO THERMAL IONIZATION A66-25425
- INITIAL PULSE IN LUMINOUS EMISSION OF DISCHARGE LASER, USING PHOTOMULTIPLIER PRECEDED BY MOBILE IRIS, DETERMINING GEOMETRICAL DISTRIBUTION OF DISCHARGE BRIGHTNESS A66-31209
- PAQUES, H.**  
SENSITIVITY OF OPTICAL SYSTEM USED IN SCHLIEREN SETUP IN DETERMINING QUALITY OF RECORDED INFORMATION A67-14606
- PARISER, B.**  
OPTICAL AND ELECTRON INTERACTIONS WITH METASTABLES - AFTERGLOW PLASMA IONIZATION PROCESS REPT.-24 N66-26512
- PARKER, J. V.**  
GA AS CRYSTAL AS ELECTRO-OPTIC MODULATOR AT 10.6 MICRONS DUE TO SMALL CARRIER ABSORPTION, FREEDOM FROM INTERBAND TRANSITIONS AND HIGH RESISTIVITY A66-42553
- PARKS, J.**  
HELIUM-NEON GAS LASER USED TO STUDY PRESSURE EFFECT ON LINE SHAPE OF 2S-2P OPTICAL TRANSITIONS OF NEON EXCITED STATES A66-26198
- PARKS, J. A.**  
LIGHT ENERGY MEASUREMENTS MADE WITH ARGON BOMB USED AS CHEMICALLY POWERED LASER PUMP A66-35388
- PARKS, J. H.**  
OPTICAL- AND I R-MASER SPECTROSCOPY OF INHOMOGENEOUSLY BROADENED RESONANCES, USING GAS LASERS A66-26196
- PARRENT, G. B.**  
READOUT TECHNIQUE FOR LASER FOG DISDROMETER A66-33346
- PARYGIN, V. N.**  
INTERNAL MODULATION OF IR GAS LASER USING CADMIUM SULFIDE OR SELENIDE SINGLE CRYSTALS A67-16914
- PASHININ, P. P.**  
GIANT-PULSE LASER-INDUCED ATMOSPHERIC ELECTRIC BREAKDOWN CAUSING OPTICAL FREQUENCY DISCHARGE A66-26194
- TEMPERATURE MEASUREMENTS OF LASER SPARKS FROM RELATIVE INTENSITY OF X-RAY FLUX TRANSMITTED THROUGH BERYLLIUM FOILS OF DIFFERENT THICKNESS A66-40421
- PASTEUR, J.**  
FREQUENCY SHIFT RELATIVE TO SPECTRAL WIDTH FOR SINGLE PULSES OF TRIGGERED LASER DETERMINED BY MEASURING VARIATIONS OF EMITTED WAVELENGTH AS FUNCTION OF TIME A66-32622
- PASTOR, R. C.**  
FEASIBILITY OF USING FLUORESCING DYES PUMPED WITH RUBY LASER FOR LOWER THRESHOLDS THAN RAMAN TYPE LASERS

- AD-636953 N66-38187  
 PASZKOWSKI, B.  
 NEODYMIUM DOPED OPTICAL GLASSES FOR LASER  
 TECHNOLOGY A67-16855
- PATEL, C. K. N.  
 LASER ACTION ON VIBRATIONAL-ROTATIONAL TRANSITIONS  
 AND VIBRATION ENERGY TRANSFER A66-26204
- OPTICAL HARMONIC GENERATION IN IR IN ZINC BLENDE,  
 HEXAGONAL AND TRIGONAL CRYSTALS, USING UNFOCUSED  
 CARBON DIOXIDE LASER IN CW AND Q-SWITCHED  
 OPERATION A66-30182
- MULTIPHOTON PLASMA PRODUCTION AND STIMULATED  
 RECOMBINATION RADIATION IN LEAD TELLURIDE,  
 CONSIDERING ELECTRON-HOLE PAIR PRODUCTION RATE  
 A66-31884
- OPTICAL NONLINEARITIES DUE TO CONDUCTION BAND  
 ELECTRONS IN IN AS, IN SB, GA AS AND PB TE  
 STUDIED, USING Q-SWITCHED CARBON DIOXIDE LASER  
 RADIATION A67-12524
- PARAMETRIC AMPLIFICATION OF FAR IR IN TE CRYSTAL  
 PUMPED BY CARBON DIOXIDE LASER A67-13572
- INELASTIC SCATTERING OF CARBON DIOXIDE LASER  
 RADIATION BY MOBILE LANDAU-LEVEL ELECTRONS IN N-  
 IN SB A67-17723
- PAUTHIER, M.  
 LASER OSCILLATOR STUDY OF COHERENT STIMULATED  
 EMISSION OF IR TRANSITIONS IN RARE GASES  
 A66-27336
- PAUTRAT, C. C.  
 FLUORESCENT-SOLID LASERS DESIGN AND PERFORMANCE  
 NOTING MATERIALS A66-33250
- PAUWELS, H. J.  
 QUANTUM THEORY FOR NOISE IN STEADY STATE OF LASER  
 OSCILLATOR ABOVE THRESHOLD, COMPARING  
 SEMICLASSICAL AND QUANTIZED LINEAR THEORIES  
 A66-25650
- PAVLENKO, N. A.  
 LASER RADIATION EFFECT ON METALS, NOTING  
 DISINTEGRATION MECHANISM, INDENTATION FORMATION  
 AND VAPOR FORMATION A66-39763
- NEODYMIUM GLASS LASER WITH SPHERICAL MIRROR  
 RESONATOR IN STATIONARY REGIME A67-18783
- PAVLICHENKO, O. S.  
 PLASMA DENSITY USING LASER BASED INTERFEROMETER,  
 INTERPRETING PHASE SHIFT OF LASER SIGNAL AS TIME  
 DEPENDENT LASER FREQUENCY VARIATION  
 A66-35817
- PEACOCK, G. R.  
 OPTICAL RAY TRACING TO PREDICT FOCUSING  
 CHARACTERISTICS OF LASER LIGHT IN REFRACTIVE  
 TARGETS, CALCULATING HEATING EFFECTS IN TARGET,  
 NOTING TARGET GEOMETRY, REFRACTIVE INDEX,  
 THICKNESS OF SKIN LAYERS, ETC A66-25531
- PEACOCK, N. J.  
 X UV C, TI, MN, FE, NI, CU, ZN AND AR LINE  
 SPECTRA AND CONTINUUM RADIATION SPECTRA IN PLASMAS  
 PRODUCED BY FOCUSED RUBY LASER BEAM  
 A66-39812
- PEARSON, G. A.  
 OPTICAL MIXING DUE TO CONDUCTION BAND ELECTRONS IN  
 SEMICONDUCTOR A67-12525
- PECHENOV, A. N.  
 LASER ACTION IN ZINC SELENIDE CRYSTALS AT 4600  
 ANGSTROMS PREPARED UNDER HIGH PRESSURE IN CLOSED  
 CONTAINER BY GAS PHASE REACTION AND FOLLOWING  
 CRYSTALLIZATION A67-20183
- PECILE, D.  
 BEATING OF OSCILLATING FREQUENCIES CORRESPONDING  
 TO TWO DIRECTIONS OF TRAVEL OF ANNULAR CAVITY  
 LASER WITH ACTIVE GAS MEDIUM IN MOVEMENT  
 A66-43007
- DRAG EFFECT OF GAS RING LASER ACTIVE MEDIUM  
 NASA-TT-F-10693 N67-18935
- PEEK, TH. H.  
 RESONATOR Q-MODULATION TECHNIQUE OBSERVATION OF  
 CENTRAL DIP TUNING IN MODULATED POWER OUTPUT OF  
 GAS LASER WITH MOVING MIRROR A67-18758
- PELLET, W.  
 LOCALIZED DEEP BRAIN TISSUE LESIONS IN CATS BY  
 LASER ENERGY A66-81895
- PENDLETON, W. K.  
 PULSE-CURRENT DELAY TIME EFFECT ON LASER TRIGGERED  
 HIGH VOLTAGE SPHERE-SPHERE GAP  
 AFWL-TR-65-32 N66-25900
- PENIN, A. N.  
 PHOTOCONDUCTIVITY INDUCED IN UNCOLORED SODIUM  
 CHLORIDE AND ALUMINUM OXIDE SINGLE CRYSTALS BY  
 RADIATION FROM RUBY LASER A66-33939
- PENNER, S. S.  
 HEAT TRANSFER AND STRESS WAVE EVOLUTION PRIOR TO  
 ABLATION AND THERMAL EQUILIBRIUM IN EXPOSURE OF  
 SOLID AND LIQUID MATERIALS TO LASER SOURCES  
 A66-32638
- PENNEY, A. W., JR.  
 SINGLE SELF-MODE-LOCKED PULSE SELECTION FROM  
 BLEACHABLE DYE Q-SWITCHED ND-DOPED GLASS LASER  
 A67-10875
- PEPPERS, N. A.  
 LASER SAFETY STANDARDS, DISCUSSING NATURE OF  
 PHOTOBIOLOGICAL MECHANISMS RESPONSIBLE FOR TISSUE  
 DAMAGE UPON EXPOSURE TO LASER RADIATION  
 A66-27775
- PERCHANOK, T. M.  
 PRESSURE DEPENDENCE OF OUTPUT POWER OF HE- NE  
 LASER ON AMPLITUDE OF PERIODIC HIGH VOLTAGE  
 EXCITATION PULSES A67-18784
- PEREBIAKIN, V. A.  
 HELIUM-NEON LASER ASSESSMENT AS SOURCE IN HIGH  
 PRECISION RANGE MEASUREMENTS A66-35362
- PEREL, V. I.  
 DIPOLE MOMENT CALCULATION FOR GAS LASER IN  
 MAGNETIC FIELD A66-29348
- DIPOLE MOMENT CALCULATION FOR GAS LASER IN  
 MAGNETIC FIELD A66-37353
- DEPENDENCE OF EMISSION INTENSITY OF GAS LASER ON  
 LONGITUDINAL AND TRANSVERSE MAGNETIC FIELDS, USING  
 SIMPLIFIED MODEL A66-41092
- PERESSINI, E. R.  
 ATOMIC IONIZATION BY INTENSE OPTICAL FIELD, NOTING  
 RUBY LASER-PULSE EFFECT ON INERT GAS BETWEEN  
 ELECTRODES A66-26189
- PERKINS, F.  
 STIMULATED EMISSION PROCESSES INTERPRETING OH  
 MICROWAVE EMISSION FROM POINTS IN SKY, USING  
 ANISOTROPIC UV RADIATION WHICH LEADS TO  
 MOLECULE ALIGNMENT AND POPULATION INVERSION  
 A66-37343
- PERSHAN, P. S.  
 MAGNETIZATION INDUCED BY CIRCULARLY POLARIZED  
 LASER LIGHT INCIDENT ON NONABSORBING MATERIAL, IN  
 ABSENCE OF EXTERNAL MAGNETIC FIELD, IN DOPED  
 CALCIUM FLUORIDE PROPORTIONAL TO LIGHT INTENSITY  
 AND VERDET CONSTANT A66-26142
- NONLINEAR OPTICS, CONSIDERING MAXWELL EQUATION  
 AND NONLINEAR MATERIAL RESPONSE A66-26964
- PESTRIAKOV, E. V.  
 RUBY LASER-INDUCED EFFECT OF PULSED PRESSURE ON  
 KDP CRYSTAL SURFACE AND THERMAL BULK EFFECT ON  
 EXCITATION OF ULTRASONIC OSCILLATION IN CRYSTAL  
 A66-40318

- PETERS, C. J.  
SENSITIVITY AND TRACKING CAPABILITIES OF PRECISION  
LASER AUTOMATIC TRACKING SYSTEM A66-25984
- PETERSON, D. G.  
FABRY-PEROT ETALON USE FOR INTERFEROMETRY AND  
LASER CONTROL, NOTING LOW ANGLE SCATTERING, LASER  
OSCILLATION, THERMAL TUNING SENSITIVITY, ETC A66-32619
- ZEEMAN LASER INTERFEROMETER, USING AXIAL MAGNETIC  
FIELD TO OBTAIN SIMULTANEOUS LEFT- AND RIGHT-HAND  
CIRCULARLY POLARIZED OSCILLATION MODES AT UPPER  
AND LOWER CAVITY RESONANCES A66-42248
- PETICOLAS, W. L.  
UNFOCUSED RUBY LASER RADIATION FIELD-BIPHENYL  
COMPOUND INTERACTION, RESULTING LUMINESCENCE AND  
APPARENT MULTIPHOTON ABSORPTION A66-38528
- PETRASH, G. G.  
LASER LINES OF PULSED DISCHARGE IN IODINE VAPOR A67-10549
- LASER LINES OF PULSED DISCHARGE IN IODINE  
VAPOR A67-11057
- PETRU, F.  
TECHNICAL ASPECTS AND USES OF GAS LASERS  
GUO-2177 N67-11969
- PETRUKHIN, A. I.  
CLEAVAGE AND SEPARATION OF DYE-DOPED ICE AND  
PARAFFIN INSTANTANEOUSLY HEATED BY LASER PULSE,  
MEASURING MECHANICAL PULSE AT ENERGY  
CONCENTRATIONS BELOW VAPORIZATION HEAT A67-18807
- PETRUNKIN, V. IU.  
NEODYMIUM GLASS LASER TIME CHARACTERISTICS AND  
SPECTRAL CHANGES DURING CONVERSION TO TRAVELING  
WAVE LASER A67-18782
- NEODYMIUM GLASS LASER WITH SPHERICAL MIRROR  
RESONATOR IN STATIONARY REGIME A67-18783
- PETTY, S. M.  
LOW NOISE RECEIVERS - TRAVELING WAVE MASER  
DEVELOPMENT N67-15913
- PEYTON, B.  
ULTRALOW-NOISE TUNABLE S-BAND AMPLIFIER USING  
TWM AS SECOND STAGE A67-10106
- PHELAN, R. J.  
FLASHLIGHT /INCOHERENT/ PUMPING OF VISIBLE AND  
IR, IN SB AND CD S- CD SE LASERS A67-10447
- PHELAN, R. J., JR.  
PHOTOLUMINESCENCE AND STIMULATED EMISSION OF  
GALLIUM ARSENIDE AND INDIUM ANTIMONIDE OBTAINED BY  
OPTICAL PUMPING, NOTING EFFECT OF APPLIED MAGNETIC  
FIELD ON LASER AND DIODE EMISSIONS A66-26182
- PHELPS, A. V.  
GROWTH RATE OF IONIZATION BY ELECTRON IMPACT IN  
PRESENCE OF LASER BEAM, ELASTIC AND INELASTIC  
SCATTERING CROSS SECTIONS, FREE-FREE ABSORPTION,  
EXCITATION AND IONIZATION COEFFICIENTS, BREAKDOWN  
TIMES AND THRESHOLDS A66-26193
- HIGH TEMPERATURE PLASMAS PRODUCED BY LASER HEATING  
TID-22132 N66-25340
- HIGH TEMPERATURE PLASMAS PRODUCED BY Q-SWITCHED  
LASER BEAM FOCUSED ON ALUMINUM TARGETS  
TID-22928 N67-13974
- PHELPS, R. G., JR.  
SELECTIVE ACCESS LASER DISPLAY BEAM POSITIONER  
RADC-TR-66-447 N67-15327
- PHENEGER, P. W.  
QUENCHING OF ONE PULSED RUBY LASER OSCILLATION BY  
ANOTHER, NOTING COUPLED RATE EQUATIONS FOR STEADY
- STATE AND TRANSIENT BEHAVIOR A67-16682
- PHILBERT, M.  
ABSOLUTE FLUX MEASUREMENT FOR PULSED AND TRIGGERED  
LASERS REQUIRING ONLY QUANTUM RECEIVERS A66-26375
- PIEKARA, A.  
SELF-TRAPPING OF LASER BEAM DUE TO DIFFRACTION  
FROM DIELECTRIC WAVEGUIDE ARISING FROM  
PERMITTIVITY INCREASE OF BIREFRINGENT BEAM A66-42554
- PIKE, E. R.  
PHOTON COUNTING DISTRIBUTIONS AND INTENSITY  
FLUCTUATIONS OF MODULATED LASER BEAMS A67-20125
- PIKUS, G. E.  
KINETIC THEORY OF SEMICONDUCTOR LASER WITH P-N  
STEP JUNCTION A66-33126
- LINE WIDTH OF SEMICONDUCTOR LASER A66-33127
- PILCHER, M. L.  
LASER BEAM ENERGY PROFILE DETERMINED BY MULTIPLE-  
LAYER ALUMINUM FOIL TECHNIQUE A66-31217
- PILIPETSKII, N. F.  
LASER BEAM EFFECT ON HARDENING OF STEEL A66-31802
- ORGANIC GLASS DISINTEGRATION INDUCED BY PULSED  
LASER BEAMS A67-12241
- MICRO- AND MACROCRACK FORMATION IN ORGANIC GLASS  
BY FOCUSING OF LASER BEAM A67-18808
- PILIPOVICH, V. A.  
LOSSES IN RUBY LASER DETERMINED FROM DATA ON  
VARIATIONS IN BEAM DIVERGENCE ANGLE AND VARIATIONS  
IN LASING SPOT DIAMETER A67-12742
- PROBABILITY METHOD OF DETERMINING ENERGY LOSSES IN  
RUBY LASER WITH MISALIGNED RESONATORS  
FTD-HT-66-492 N67-19235
- PILKUN, M.  
SPONTANEOUS AND STIMULATED EMISSION FROM GA AS  
DIODES WITH THREE-LAYER STRUCTURES CONSISTING OF  
N-N-P, N-I-P OR N-P-P DIODES A66-40102
- PILTCH, M.  
ALUMINA HIGH TEMPERATURE GAS DISCHARGE TUBE FOR  
INVESTIGATION OF PULSED METAL VAPOR LASER  
OSCILLATIONS A66-35810
- PULSED GAS DISCHARGE LASERS NOTING REQUIRED  
ENERGY LEVEL FOR MAXIMUM EFFICIENCY, EXPERIMENTAL  
TECHNIQUES AND RESULTS A67-16650
- PIMENTEL, G. C.  
SELF-PUMPING CHEMICAL LASER THEORY AND OPERATION,  
NOTING CHEMICAL PUMPING A66-26382
- PINE, A.  
SELECTIVE FEEDBACK AND SATURATION MECHANISMS OF  
RAMAN LASERS USING SECONDARY RAMAN LINES,  
EMPHASIZING CYCLOHEXANE A66-37777
- PINE, A. S.  
OPTICAL HETERODYNE TECHNIQUE DETECTING STIMULATED  
BRILLOUIN SCATTERING, NOTING FREQUENCY SHIFT  
DEMODULATION ARISING FROM RUBY LASER LIGHT  
INCIDENCE ON QUARTZ CRYSTAL A67-16688
- PINSKER, I. Z.  
INDIUM PHOSPHIDE BASED SEMICONDUCTOR LASER  
AMPLIFICATION, LOSS FACTOR AND RADIATION PATTERN  
A67-10065
- THRESHOLD AND POWER CHARACTERISTICS OF GALLIUM  
ARSENIDE DIODE LASER OPERATING IN PULSED REGIME  
A67-10066
- PISA, E. J.  
OPTICAL SURFACE ROUGHNESS MEASUREMENT USING  
COHERENT RADIATION PRODUCED BY HELIUM-NEON LASER



- SIGMA-POLARIZED AT 6328 ANGSTROMS  
A67-10020
- PLESHKOV, A. A.  
TIME STRUCTURE AND AMPLITUDE SELF-MODULATION OF  
EMISSION FROM GA AS INJECTION LASER OBSERVED,  
USING ELECTRON-OPTICAL CONVERTER  
A67-17756
- PLOTKIN, H. H.  
OPTICAL SATELLITE TRACKING ANALYSIS USING PULSED  
LASER REFLECTION  
N66-32076
- LASER REFLECTIONS FROM BEACON EXPLORER  
SATELLITE  
NASA-TM-X-57166  
N67-18446
- PODGAETSKII, V. M.  
MEASUREMENT OF RADIATION PATTERN OF RUBY LASER  
EMISSION FOR VARIOUS RESONATORS AND OPERATING  
REGIMES, NOTING LASER EFFECT ON ANGULAR HALF-  
WIDTH VALUES  
A66-30847
- POGORELOVA, E. V.  
INTERBAND ELECTRON ABSORPTION AND DISPERSION  
DURING ONE- AND TWO-PHOTON PROCESSES IN  
SEMICONDUCTORS SUBJECTED TO ELECTROMAGNETIC FIELD,  
NOTING LASER APPLICATIONS  
A67-18798
- POHL, H. J.  
PHOTOELECTRONIC COMPONENTS AND ELECTRONIC  
MEASUREMENT TECHNIQUES IN RECEPTION AND  
DEMODULATION OF HF MODULATED LASER BEAMS  
A67-10300
- POKROVSKII, A. G.  
RADIATION CONTROL OF RUBY LASER BY DIFFRACTION  
MODULATOR WITH TRAVELING ULTRASONIC WAVE, NOTING  
COMPUTER SOLUTION OF KINETIC EQUATIONS OF  
POPULATION BALANCE, RADIATION DENSITY,  
CHARACTERISTIC DAMPING, ETC  
A66-33515
- RADIATION CONTROL OF RUBY LASER BY DIFFRACTION  
MODULATOR WITH TRAVELING ULTRASONIC WAVE, NOTING  
COMPUTER SOLUTION OF KINETIC EQUATIONS OF  
POPULATION BALANCE, RADIATION DENSITY,  
CHARACTERISTIC DAMPING, ETC  
A66-42128
- POLANYI, T. G.  
FREQUENCY STABILIZATION OF GAS LASER TO LOCK  
OUTPUT TO CENTER OF ATOMIC RESONANCE, USING ERROR  
SIGNAL  
A66-38241
- POLE, R. V.  
ELECTRON-BEAM-CONTROLLED CRT SCANLASER  
A66-25557
- ELECTRON BEAM SCANLASER BASED ON LASER CAVITY  
DIRECTLY AND/OR TRANSVERSELY DEGENERATE HAVING Q-  
SPOILED FOR ALL MODES BUT ONE  
A66-38244
- WIDE FIELD ACTIVE IMAGING, IMAGE PROCESSING IN  
WHICH PICTORIAL INFORMATION IS PLACED WITHIN LASER  
CAVITY  
A66-42559
- POLK, D. H.  
HIGH TEMPERATURE HIGH-DENSITY PLASMA FROM SINGLE  
SOLID PARTICLE OF LITHIUM HYDRIDE SUSPENDED IN  
VACUUM, USING RUBY LASER IRRADIATION  
A66-36596
- HIGH TEMPERATURE SINGLE SOLID PARTICLE PLASMA  
GENERATION BY FOCUSED GIANT PULSE Q-SPOILED RUBY  
LASER BEAM IRRADIATION OF LI H SUSPENDED IN  
VACUUM ELECTRIC FIELDS  
A67-14047
- POLLACK, M. A.  
LASER OSCILLATION IN FLASH PHOTOLYSIS OF CARBON  
DISULPHIDE AND OXYGEN TO FORM CO  
A66-31941
- MOLECULAR LASER ACTION BY VIBRATIONAL EXCITATION  
OF NITRIC OXIDE DURING FLASH PHOTOLYSIS OF  
NITROSYL CHLORIDE  
A66-39166
- LASER ACTION IN OPTICALLY PUMPED CN, DISCUSSING  
VIBRATIONAL-ROTATIONAL TRANSITIONS  
A67-10370
- POLLONI, R.  
EXPERIMENTAL OBSERVATION OF REGULAR SPIKING IN  
NEODYMIUM DOPED GLASS LASER ROD ATTRIBUTED TO  
SIMULTANEOUS OSCILLATION OF MANY TRANSVERSE AND  
LONGITUDINAL MODES  
A66-28727
- PONOMAREVA, I. P.  
REGENERATIVE HELIUM-NEON LASER WITH AMPLIFICATION  
COEFFICIENT OF 1000  
A66-29352
- REGENERATIVE HELIUM-NEON LASER WITH AMPLIFICATION  
COEFFICIENT OF 1000  
A66-37357
- POPELA, B.  
TUNING OF GAS LASER RESONATOR  
A67-19505
- POPICK, H.  
LASER SYSTEM FOR DYNAMICALLY BALANCING GYRO ROTORS  
AND STATICALLY BALANCING ACCELEROMETERS  
NASA-CR-82449  
N67-19130
- POPOV, A. K.  
SEMICLASSICAL THEORY OF QUANTUM GENERATORS,  
EXAMINING LASER SYSTEM RESPONSE TO EFFECT OF  
MONOCHROMATIC STANDING WAVE BASED ON KINETIC  
EQUATION FOR DENSITY MATRIX  
A66-30865
- GAS LASER FREQUENCY AND EMITTED POWER DEPENDENCE  
ON RESONATOR TUNING  
A66-39308
- POPOV, IU. M.  
GALLIUM ARSENIDE LASERS OPERATING AT ROOM  
TEMPERATURE INVESTIGATED, BASED ON DIFFUSION P-N  
JUNCTIONS, DISCUSSING EMISSION SPECTRUM  
A66-36070
- SEMICONDUCTOR LASERS USING SINGLE AND DOUBLE  
PHOTON OPTICAL EXCITATION  
A67-18930
- POPOV, IU. V.  
EXPERIMENTAL STUDY OF EMISSION CONTROL IN RUBY  
LASER USING DIFFRACTION MODULATOR WITH MODULATED  
TRAVELING ULTRASONIC WAVE  
A66-33516
- EXPERIMENTAL STUDY OF EMISSION CONTROL IN RUBY  
LASER USING DIFFRACTION MODULATOR WITH MODULATED  
TRAVELING ULTRASONIC WAVE  
A66-42129
- POPOV, M. M.  
RADIATIVE POWER AMPLIFICATION OF HE- NE LASER  
WITH NEARLY CONFOCAL RESONATORS  
A66-41453
- RADIATIVE POWER AMPLIFICATION OF HE- NE LASER  
WITH NEARLY CONFOCAL RESONATORS  
A67-14190
- POPOVA, M. M.  
DYNAMICS OF FIELD AND GENERATION FREQUENCIES IN  
GIANT PULSE OF RUBY LASER WITH PASSIVE SHUTTER,  
USING SOLUTION OF CRYPTOCYANINE IN ETHANOL, NOTING  
MIRROR REFLECTION COEFFICIENT  
A66-29727
- PORTEOUS, P.  
INDIUM ARSENIDE DIODE LASER FABRICATION USING  
LIQUID PHASE EPITAXY, NOTING QUANTUM EFFICIENCY  
A67-17096
- POST, E. J.  
SAGNAC EFFECT - INTERFEROMETER OR RING LASER FOR  
ELECTROMAGNETIC SENSING OF ABSOLUTE ROTATION  
AFCL-66-311  
N66-39733
- POTAPOV, S. E.  
NEODYMIUM GLASS LASER WITH SPHERICAL MIRROR  
RESONATOR IN STATIONARY REGIME  
A67-18783
- POWERS, E. J.  
STRONG AXIAL MAGNETIC FIELD EFFECT ON CONSTANT  
CURRENT DISCHARGE IN CONTINUOUS-DUTY ION LASER,  
NOTING PLASMA DIFFUSION, CHARGED PARTICLE DENSITY  
AND LASER OUTPUT DECREASE  
A66-33117
- PRATESI, R.  
POWER ENHANCEMENT IN PULSED HE- NE LASERS, NOTING  
OVERSHOOTING FOR RF DISCHARGE MODULATION WITH  
SQUARE WAVE  
A66-32963
- ENHANCED LASING OF HIGH PRESSURE HE- NE LASER,

- COMMENTING ON DELAY TIME OF LIGHT PULSE EMITTING THROUGH WALLS OF DISCHARGE TUBE FROM START OF EXCITING PULSE A67-16687
- TIME BEHAVIOR OF LIGHT EMITTED FROM MANY-ELEMENT LASER - MICROWAVE MODELS OF LASER RESONATORS ASR-1 N67-10283
- PRATT, G. W., JR.  
FREQUENCY MODULATION OF GaAs SEMICONDUCTOR LASER BY ULTRASONIC WAVE MODULATION OF DIELECTRIC CONSTANT A67-16671
- PRESBY, H. M.  
LASER PHASOGRAPHY OF JETS, SHOCK WAVES, AND PLASMAS  
AFCRL-66-299 N66-33273
- PRESCOTT, L. J.  
DISCHARGE CURRENT AND LASER LIGHT NOISE MEASUREMENTS EFFECT IN GAS DISCHARGE HELIUM-NEON LASER, USING EQUIVALENT CIRCUIT A66-38240
- PRESS, W.  
ENERGY-RICH PLASMAS PRODUCED BY LIGHT PULSES FROM Q-SWITCHED LASER, NOTING ENERGY TRANSFER FROM ELECTRONS TO IONS DURING EXPANSION PROCESS A66-27607
- PRESSLEY, R. J.  
DEUTERIUM ISOTOPE EFFECT ON THRESHOLDS OF EUROPIUM CHELATE LASERS, NOTING SOLVENT THERMAL EFFECTS A66-26598
- CRYSTALLINE SOLID LASERS, CONSIDERING RARE EARTH AND TRANSITION METAL IMPURITIES AND HOST MATERIALS, NOTING CW LASER CHARACTERISTICS A66-42799
- Y AG SOLID STATE LASER SYSTEM, DISCUSSING OUTPUT, THEORETICAL LIMITS, PERFORMANCE CHARACTERISTICS, ETC A67-19084
- PRICE, E. V.  
Q-SWITCHED RUBY LASER CONFIGURATION WITH FEEDBACK CONTROL, NOTING FREQUENCY AND INSTABILITY CORRELATION WITH THEORETICAL RESULTS OBTAINED FROM MATHEMATICAL MODEL A67-16676
- PRICHKO, IU. V.  
MEASURING AMPLIFICATION OF COHERENT OPTICAL RADIATION IN NEON-HELIUM FILLED TUBE A66-33512
- MEASURING AMPLIFICATION OF COHERENT OPTICAL RADIATION IN NEON-HELIUM FILLED TUBE A66-42125
- PRIFTI, W.  
LASER MACHINING, DISCUSSING HOLE DRILLING, MICROWELDING METAL REMOVAL AND APPLICATION TO HARD BRITTLE MATERIALS  
ASME PAPER 66-MD-28 A66-38484
- PRISHIVALKO, A. P.  
GEOMETRICAL OPTICS APPROXIMATION SOLUTION TO RADIATION POWER OF GAS LASER AS FUNCTION OF MIRROR MISALIGNMENT ANGLE  
TG-230-T474 N66-34884
- PROKHOROV, A. M.  
GIANT-PULSE LASER-INDUCED ATMOSPHERIC ELECTRIC BREAKDOWN CAUSING OPTICAL FREQUENCY DISCHARGE A66-26194
- CD S SINGLE CRYSTAL OPTICAL GENERATOR DURING EXCITATION BY RUBY LASER, DISCUSSING TWO-PHOTON ABSORPTION COEFFICIENT AT 300 DEGREES K FOR RADIATION FLUX DENSITIES A66-27576
- STIMULATED EMISSION FROM SAMARIUM-DOPED CALCIUM FLUORIDE CRYSTAL EXCITED BY RUBY LASER A66-29358
- STIMULATED EMISSION FROM SAMARIUM-DOPED CALCIUM FLUORIDE CRYSTAL EXCITED BY RUBY LASER A66-37362
- RUBY LASER RADIATION EFFECT ON FLUORESCENCE AND LASER ACTION IN DYSPROSIUM DOPED CALCIUM FLUORIDE CRYSTALS A66-37656
- DIVALENCE SAMARIUM ION DOPED CALCIUM FLUORIDE LASER ACTION AT LOW TEMPERATURES OBTAINED WITH GIANT PULSE RUBY LASER EXCITATION A67-16661
- OSCILLATION IN CD S CRYSTAL BY RUBY LASER INDUCED TWO-PHOTON EXCITATION, NOTING PROPORTIONALITY OF ABSORPTION COEFFICIENT TO LIGHT BEAM INTENSITY A67-16667
- DYSPROSIUM DOPED CALCIUM FLUORIDE GIANT PULSE LASER WITH HIGH REPETITION RATE OBTAINED, USING DC PUMPING XENON LAMP A67-16674
- PROKHOROV, V. K.  
LASER REGIME WITH GIANT PULSES GENERATED IN DYSPROSIUM DOPED CADMIUM FLUORIDE UNDER CONTINUOUS PUMPING BY XENON LAMPS, OBTAINING Q FACTOR MODULATION BY ROTATING PRISM A66-34178
- PROTSENKO, E. D.  
NE- HE LASER OUTPUT DEPENDENCE ON PRESSURE AND NONEXCITED ATOM CONCENTRATION A66-34696
- PERFORMANCE CHARACTERISTICS FOR PULSE TYPE AR LASER WITH EXTERNAL INTERFERENTIAL SYSTEM OF QUASI-CONFOCAL SPHERICAL MIRRORS A66-41452
- NE- HE LASER OUTPUT DEPENDENCE ON PRESSURE AND NONEXCITED ATOM CONCENTRATION A67-10512
- PERFORMANCE CHARACTERISTICS FOR PULSE TYPE AR LASER WITH EXTERNAL INTERFERENTIAL SYSTEM OF QUASI-CONFOCAL SPHERICAL MIRRORS A67-14188
- PUGACH, I. P.  
S HF MODULATION TECHNIQUES FOR LASER RADIATION, COVERING FARADAY, KERR AND POKEL EFFECTS, CIRCULAR DICHROISM, ETC A67-13138
- PURSEY, H.  
DETECTION OF VERY LOW LEVELS OF MODULATION ON LASER BEAM TO DETERMINE PERFORMANCE OF MICROWAVE LIGHT MODULATORS A66-29682
- PUTHOFF, H. E.  
STIMULATED RAMAN EFFECT AND TUNABILITY OF RAMAN LASER A66-25062
- COUPLING OF ADJACENT AXIAL MODES IN EXTERNAL RAMAN RESONATOR OBSERVED AS FIRST STOKES FREQUENCY WITH BENZENE AS RAMAN MEDIUM AND Q-SWITCHED RUBY LASER AS PUMP SOURCE A66-39109
- PYATT, K. D.  
ELECTRON DENSITY, OPTICAL THICKNESS AND TEMPERATURE OF RUBY LASER-INDUCED CARBON PLASMA A67-16654
- QUATE, C. F.  
MICROWAVE RESEARCH ON ELECTROACOUSTIC AMPLIFIERS, OPTICAL MASERS, STIMULATED RAMAN EFFECT, ACOUSTIC WAVE OPTICS, SEMICONDUCTOR OSCILLATION, NONUNIFORM PLASMAS, AND FERROMAGNETIC METALS  
ML-1464 N67-16325
- QUELLE, F. W., JR.  
THERMAL OPTICAL BEHAVIOR OF GLASSES AND OTHER POTENTIAL LASER MATERIALS AND THERMAL DISTORTION IN AIR, WATER, BENZINE, ETHANOL AND TOLUENE A66-25996
- QUINN, H. F.  
1.60 MICRON STIMULATED AND SPONTANEOUS EMISSIONS FROM EPITAXIAL SINGLE CRYSTALS IN QUASI-BINARY III-V COMPOUND SEMICONDUCTOR DIODES OF INJECTION LASERS AT 77 DEGREES K A66-39750
- QUINN, J. M. P.  
HELIUM-NEON GAS LASER USED TO DETERMINE ELECTRON

DENSITY VARIATION, SPATIAL AND TEMPORAL, IN  
AFTERGLOW OF Z-PINCH IN H AT 100 MTORR  
A66-26239

## R

RAAB, S.  
SPECTRAL ANALYSIS OF EMISSION OF SPATIALLY  
SEPARATED SPOTS IN GA AS INJECTION LASERS  
A67-20185

RABINOVICH, M. S.  
FAST OVERLAP OF MICROWAVE RADIATION BY IONIZATION  
AUREOLE OF SPARK IN LASER BEAM  
A66-36719

SIGNAL EXCITATION IN NEGATIVELY CHARGED ANTENNA  
ROD IN EFFECT OF UNFOCUSED LASER BEAM  
A66-42753

SIGNAL EXCITATION IN NEGATIVELY CHARGED ANTENNA  
ROD IN EFFECT OF UNFOCUSED LASER BEAM  
A67-10835

PUMPING MEDIUM POWER LASERS USING ARTIFICIAL  
METEORS TO PRODUCE INTENSE GAS GLOW IN COMPRESSION  
WAVE  
A67-17757

HALATION OF PHOTOIONIZATION OF LIGHT SPARK  
INVESTIGATED, USING SUPER HIGH FREQUENCY RADIO  
RADIATION, FOR RUBY LASER  
TT-66-61469  
N66-34061

RABSON, T. A.  
HIGH TIME RESOLUTION POLARIMETER FOR LASER  
ANALYSIS, BEAM INTENSITY AFTER PASSING THROUGH  
ANALYZERS MEASURED BY PHOTOMULTIPLIERS  
A66-37285

RACETTE, G. W.  
SECOND HARMONIC GENERATION OF LIGHT ANALYZED,  
STRESSING SATURATION EFFECTS OCCURRING AT HIGH  
LASER POWER, SOLVING NONLINEAR MAXWELL EQUATIONS  
A66-26144

LINEAR ABSORPTION EFFECT ON THRESHOLD FOR SELF-  
FOCUSING OF LASER BEAM IN CADMIUM SULFIDE, NOTING  
VARIATION OF ABSORPTION COEFFICIENT  
A66-31537

RADO, W. G.  
PLASMA RESONANCE AND SCATTERING, THRESHOLD  
VARIATION AND OPTICAL REFLECTIVITY IN PULSED LASER  
BEAM-INDUCED GAS BREAKDOWN  
A66-26192

RAFFY, J.  
TIME EVOLUTION OF LASER INDUCED FRACTURES IN  
GLASS, NOTING CRACK PROPAGATION ACCOMPANIED BY  
SPARKING  
A67-12508

RAIZER, I. U. P.  
BREAKDOWN OF GASES UNDER INFLUENCE OF LASER SPARK  
PHENOMENA WITH SUBSEQUENT ABSORPTION OF LASER  
RADIATION AND GAS HEATING  
A66-32061

RAMACHANDRA RAO, D.  
TRANSITIONS OF FIRST TWO BAND SYSTEMS OF IODINE  
EXCITED IN ARGON SUITABLE FOR LASER ACTION  
A66-42085

RAMBERG, E. G.  
LASER HOLOGRAPHY, DISCUSSING VARIOUS METHODS OF  
WAVE FRONT RECONSTRUCTION  
A67-19092

RAMM, D.  
LASER PUMPING BY INTENSE NOBLE GAS DISCHARGE IN  
ZETA-PINCH GEOMETRY  
A66-25995

RAMSAY, J. V.  
CONSTRUCTION METHODS OF DC OPERATED HE/ NE LASER  
TUBES USING OPTICAL CONTACT BONDS  
A67-14763

RAMSDEN, S. A.  
ELECTRON DENSITY IN LASER-INDUCED SPARK IN AIR  
DETERMINED, MEASURING SIMULTANEOUSLY FUNDAMENTAL  
LASER WAVELENGTH AND SECOND HARMONIC  
A66-28685

COOPERATIVE INTERACTIONS BETWEEN IONS AND

ELECTRONS IN FORWARD SCATTERING OF RUBY LASER BEAM  
FROM PLASMA  
A66-30153

TEMPERATURE MEASUREMENTS OF LASER SPARKS FROM  
RELATIVE INTENSITY OF X-RAY FLUX TRANSMITTED  
THROUGH BERYLLIUM FOILS OF DIFFERENT THICKNESS  
A66-40421

RANK, D. H.  
STIMULATED BRILLOUIN SCATTERING FROM NITROGEN AND  
METHANE USING GIANT PULSE LASER, NOTING  
CONVERGENCE ANGLE OF BACKSCATTERED BEAM SOUND,  
VELOCITY MEASUREMENT, ETC  
A66-32627

H-2 STOKES RAMAN OSCILLATOR OPERATING AT 9755  
ANGSTROMS, FINDING PERFORMANCE AS EXPECTED OF  
LASER OSCILLATORS WITH BEAM INSTABILITY NOT  
DEVELOPED  
A67-12516

OPTICAL PHENOMENA IN LIQUID AND GASEOUS MEDIA  
AD-626808  
N66-35526

BRILLOUIN SPECTRA OF ACETONE, ETHYL ALCOHOL,  
WATER, CARBON BISULFIDE, TOLUENE, AND CARBON  
TETRACHLORIDE USING HELIUM-NEON LASER AND  
PHOTOELECTRIC DETECTION  
N66-35529

RUBY LASER INDUCED BREAKDOWN IN OXYGEN GAS AT HIGH  
PRESSURE  
N66-35531

STIMULATED RAMAN EFFECT IN LIQUID STANNIC  
CHLORIDE AND METHANE GAS USING MEDIUM POWER  
RUBY LASER  
N66-35532

STIMULATED BRILLOUIN EFFECT IN HIGH PRESSURE  
GASEOUS NITROGEN, METHANE, AND CARBON DIOXIDE  
USING GIANT PULSE LASER  
N66-35533

EFFECT OF POWER AND PATH LENGTH ON THRESHOLD FOR  
STIMULATED RAMAN SPECTRA  
N66-35535

RANK, D. M.  
CLEAR AIR TURBULENCE DETECTION WITH LASER RADAR,  
NOTING AIRBORNE EQUIPMENT AND RESULTS  
A67-15304

RASBERRY, S. D.  
SPECTROCHEMICAL ANALYSIS OF SOLID SPECIMEN FROM  
VAPOR FORMED BY LASER BEAM AND EXCITED BY SPARK  
DISCHARGE  
A67-16786

RASHAD, A. R. M.  
SELF-FOCUSING OF LASER BEAM IN PLASMA, SOLVING  
WAVE EQUATION FOR SLAB AND CYLINDRICAL BEAM  
CONFIGURATIONS  
A67-12089

RASMUSSEN, M. L.  
VELOCITY DISTRIBUTION FUNCTION MEASUREMENT OF GAS  
BASED ON LASER BEAM ATTENUATION  
SUDAAR-275  
N67-18270

RATNER, A. M.  
UNCOUPLED INTENSITY PEAKS IN LASER EMISSION  
A67-13132

EMISSION LOSSES IN SOLID STATE LASER RESONATOR  
CALCULATED FOR ND GLASS LASER  
A67-13133

STEADY STATE LASER RADIATION DURING RELAXATION,  
DISCUSSING TIME-DEPENDENT SPECTRAL COMPOSITION,  
OSCILLATION MODES AND POLARIZATION CHARACTERISTICS  
A67-13134

PULSED LASER Q-FACTOR MODULATION USING NONLINEAR  
RESONATOR FUNCTIONS IN ABSORBING MEDIUM  
A67-13135

RAUTIAN, S.  
DOPPLER AND IMPACT BROADENING OF SPECTRAL LINES  
AND PRESSURE EFFECTS ON POWER OUTPUT OF GAS LASER  
A67-16643

RAUTIAN, S. G.  
EFFECT OF DOPPLER AND IMPACT LINE BROADENING OF  
SPECTRAL CHARACTERISTICS OF GAS LASER, NOTING  
STANDING MONOCHROMATIC WAVE SATURATION  
A67-14197

- RAWSON, E. G.  
DUST PARTICLES IN LASER CAVITY OBSERVED FOR  
ANGULAR STABILIZATION AND CONSTANT VELOCITIES  
A66-26594
- RAZDOBARIN, G. T.  
ELECTRON TEMPERATURE AND CONCENTRATION IN DC  
PLASMA ARC DETERMINED FROM THOMSON SCATTERING OF  
LASER RADIATION A66-33840
- ELECTRON TEMPERATURE AND CONCENTRATION IN DC  
PLASMA ARC DETERMINED FROM THOMSON SCATTERING OF  
LASER RADIATION A67-13209
- READY, J. F.  
PARTICLE EMISSION FROM SURFACE INTERACTING WITH  
LASER BEAM A67-12180
- POSITIVE ION EMISSION FROM TUNGSTEN SURFACES LASER  
IRRADIATED STUDIED, USING TIME-OF-FLIGHT  
SPECTROMETER A67-16651
- INVESTIGATIONS OF HIGH POWER LASER RADIATION  
INTERACTION WITH SURFACES USING QUADRUPOLE AND  
TIME-OF-FLIGHT MASS SPECTROMETERS  
AD-636680 N66-38247
- REDIKER, R. H.  
IN AS LASER EMISSION, DISCUSSING RADIATIVE  
TRANSITIONS, COHERENT EMISSION FROM IN AS DIODES,  
RECOMBINATION MECHANISMS IN IR RADIATION SPECTRA,  
ETC A66-25065
- REHM, T. R.  
BUBBLE GROWTH PARAMETERS IN SATURATED AND  
SUBCOOLED NUCLEATE BOILING AND ANALYSIS OF  
SINGLE BUBBLE GENERATED BY USING LASER BEAM  
ON THERMOCOUPLE OR FLAT PLAT SUBMERGED IN WATER  
NASA-CR-81673 N67-17962
- RENO, C. W.  
SOLAR PUMPING AND MODULATION OF VARIOUS LASER  
MATERIALS FOR DEEP SPACE COMMUNICATION, NOTING TV  
PICTURE TRANSMISSION A66-28971
- RENSCH, D.  
INEXPENSIVE CARBON DIOXIDE MOLECULAR GAS LASER  
USING PLANO-CONCAVE EYEGGLASS LENSES  
A67-10827
- RENSCH, D. B.  
DISCHARGE TUBE DIMENSIONS, FLOW RATE, WALL  
TEMPERATURE, AND GAS MIXTURES DEFINED FOR CARBON  
DIOXIDE GAS LASER  
NASA-CR-81332 N67-16633
- REYNOLDS, D. C.  
LASING POTENTIALS OF COMPOUNDS PREPARED FROM  
ELEMENTS OF GROUP II AND GROUP IV IN PERIODIC  
TABLE N67-16953
- REZNICHENKO, V. IA.  
LASER-GENERATION-TYPE LUMINESCENCE CD S- CD SE  
CRYSTALS EXPOSED TO DOUBLE PHOTON EXCITATION FROM  
RUBY LASER A66-27647
- LUMINESCENCE IN CADMIUM SULFIDE MIXED CRYSTALS OF  
WIDELY VARYING COMPOSITION IN PRESENCE OF  
EXCITATION BY RUBY LASER EMISSION  
A67-13153
- REZVOV, A. V.  
EFFECTIVE BRIGHTENING OF LASER RADIATION  
PROPAGATING IN STRONGLY ABSORBING MEDIUM  
A66-39770
- RHODES, C. K.  
MOLECULAR GAS LASER Q-SWITCHING TECHNIQUES,  
DETERMINING ROTATIONAL COLLISION SECTIONS FOR  
CARBON DIOXIDE AND CROSS SECTIONS FOR VIBRATIONAL  
RELAXATION A67-16632
- RICHARDSON, M. C.  
RUBY LASER GIANT PULSE OFF-AXIAL MODES DETECTED  
WITH HIGH RESOLUTION SPHERICAL FABRY- PEROT  
INTERFEROMETER A66-41627
- INTENSITY DEPENDENT FREQUENCY SHIFT IN SPECTRAL  
OUTPUT OF MONOCHROMATIC GIANT PULSE LASERS
- MEASURED, USING FABRY- PEROT INTERFEROMETER  
A67-10251
- RIECKHOFF, K. E.  
UNFOCUSED RUBY LASER RADIATION FIELD-BIPHENYL  
COMPOUND INTERACTION, RESULTING LUMINESCENCE AND  
APPARENT MULTIPHOTON ABSORPTION A66-38528
- SELF-INDUCED DIVERGENCE OF CONTINUOUS WAVE HE- NE  
LASER BEAMS WHEN TRAVERSING TRANSPARENT LIQUID,  
NOTING NONLINEAR EFFECT IN PROPAGATION OF LIGHT  
A66-39164
- RIEDEL, E. P.  
SPECTROSCOPIC, CHEMICAL AND LASER PROPERTIES OF  
PIPERIDINIUM SALT OF EUROPIUM TETRAKIS  
A66-43034
- RIGDEN, J. D.  
TUBE DIAMETER INFLUENCE ON OUTPUT POWER AND  
EFFICIENCY OF GAS LASER A67-16629
- RIPPER, J. E.  
FREQUENCY MODULATION OF GA AS SEMICONDUCTOR LASER  
BY ULTRASONIC WAVE MODULATION OF DIELECTRIC  
CONSTANT A67-16671
- RISGIN, O.  
SPECTROSCOPY OF LITHIUM FLUORIDE CRYSTALS  
ACTIVATED WITH URANIUM TRIOXIDE FOR LASER ACTION,  
SHOWING ANOMALOUS FLUORESCENT DECAY UNDER HIGH  
INTENSITY PUMPING A66-25997
- RISKEN, H.  
FOKKER- PLANCK EQUATION APPLIED TO LASER UNDER  
INFLUENCE OF QUANTUM FLUCTUATIONS CONNECTED WITH  
DISSIPATION, PUMPING AND CAVITY THERMAL NOISE,  
NOTING DISTRIBUTION AND CORRELATION FUNCTION  
A66-38930
- PHASE AND AMPLITUDE FLUCTUATION OF GAS AND SOLID  
STATE LASERS, ACCOUNTING FOR NOISE CAUSED BY  
PUMPING, INCOHERENT DECAY, LATTICE VIBRATIONS AND  
ATOMIC COLLISIONS A67-14949
- RITTLER, M. C.  
RETINAL LESIONS PRODUCED BY RUBY LASER IN RABBITS  
AND HUMANS A66-82224
- RIVLIN, L. A.  
TIME STRUCTURE AND AMPLITUDE SELF-MODULATION OF  
EMISSION FROM GA AS INJECTION LASER OBSERVED,  
USING ELECTRON-OPTICAL CONVERTER  
A67-17756
- RIZZO, J. E.  
MERCURY, CESIUM AND RUBIDIUM VAPORS IONIZATION IN  
INTENSE RADIATION FLUX BY Q-SWITCHED RUBY LASER  
A66-41156
- ROBERT, A.  
IRON DOPED RUTILE TRAVELING WAVE MASER OPERATING  
IN 34-36 G HZ FREQUENCY RANGE A67-19605
- ROBERTELLO, G. J.  
MEASUREMENT OF EXCITED STATE ABSORPTION CROSS  
SECTION IN RUBY AT RUBY LASER WAVELENGTH  
GSP/PH/66-17 N66-34481
- ROBERTS, H. N.  
HIGH-TEMPERATURE RESEARCH WITH INFRARED MASER FOR  
TIME-SPACE RESOLVED DIAGNOSTICS OF DEUTERIUM  
PLASMAS  
ARL-65-270 N66-30302
- ROBINSON, M.  
GROWTH OF SINGLE CRYSTALS OF RARE-EARTH FLUORIDES  
FOR LASER APPLICATION, USING HYDROGEN FLUORIDE  
ATMOSPHERE, NOTING ION EXCHANGE PURIFICATION  
A66-31082
- ROCKWELL, R. J.  
CEREBRAL CORTEX OF DOG AS AFFECTED BY LASER  
RADIATION A66-82035
- RODOT, M.  
INDIUM ARSENIDE LASERS AND HG TE- CD TE  
PHOTODETECTORS WITH VERY FAST TIME CONSTANTS FOR

- IR SPECTRAL BAND A66-36268
- SEMICONDUCTOR LASERS AND FAST IR DETECTORS,  
DISCUSSING IN AS, IN SB AND THREE TYPES OF  
MERCURY CADMIUM TELLURIDE DETECTORS A67-16668
- ROESS, D.  
RELAXATION OSCILLATION IN SINGLE-MODE OPERATION OF  
ROOM-TEMPERATURE CW RUBY LASER A66-27026
- PUMPING NEODYMIUM LASERS THROUGH USE OF COHERENT  
EMISSION OF RUBY LASERS, FINDING THRESHOLD ENERGY A66-27605
- AXIAL AND TRANSVERSE MODE SELECTION, EMISSION  
SPECTRUM AND TRANSIENT EMISSION BEHAVIOR OF  
CONFOCAL RUBY LASER OPERATED IN ELLIPSOIDAL  
PUMPING SYSTEM A66-27606
- RESONATOR TRANSIENTS USED TO SHORTEN GIANT LIGHT  
PULSES GENERATED IN Q-SWITCHED LASER OSCILLATORS  
TO PUMP SECONDARY LASER OSCILLATOR WITH SUITABLE  
ABSORPTION BAND A66-31077
- BEAM DIVERGENCE AND FAR FIELD PATTERNS IN RUBY  
LASERS A66-31098
- GIANT PULSES FROM NEODYMIUM GLASS LASER PUMPED BY  
GIANT PULSES FROM RUBY LASER A66-31354
- CONFOCAL RESONATOR THEORY INSTEAD OF DIFFRACTION  
AS EXPLANATION OF 90 DEGREE ROTATION BETWEEN NEAR  
AND FAR FIELDS OF RUBY LASERS A66-38243
- C W RUBY LASER OF 10-MM LENGTH IN ELLIPSOIDAL  
PUMPING SYSTEM UNDER WATER COOLING, NOTING VARIOUS  
MODES A66-40100
- RUBY LASER PUMPING SYSTEM AND LOW COST MERCURY  
FLASH TUBE WITH HIGH REPETITION RATES USED FOR  
MICROMACHINING PROCESS A66-40336
- MODE SELECTION, RELAXATION OSCILLATIONS, MODE  
INTERACTION AND THERMAL EFFECTS IN ROOM  
TEMPERATURE CW LASERS IN ELLIPSOIDAL PUMPING  
SYSTEMS A66-42546
- BOOK ON LASERS, LIGHT AMPLIFIERS AND OSCILLATORS  
NOTING OPTICAL RESONATORS, OPTICAL PUMPING, PULSED  
LASERS, ETC A67-19469
- OPTICAL PULSE AMPLIFIERS WITH ACTIVE SATURABLE  
ABSORPTION SWITCHES A67-13064
- ROESSGER, E.  
RADIATION ATTENUATION EFFECT OF ATMOSPHERIC  
AEROSOLS ON ALL-WEATHER AIRCRAFT LANDING GUIDANCE  
SYSTEMS USING LASERS A66-36051
- ROIG, J.  
INTERFERENCES BETWEEN WAVES DIFFRACTED BY CIRCULAR  
SCREENS OR THIN WIRES AND COHERENT BACKGROUND  
PROVIDED BY LASER, PRODUCING RINGS OR RECTILINEAR  
FRINGES A67-10231
- INTERFERENCES BETWEEN COHERENT LIGHT BACKGROUND  
AND LIGHT DIFFRACTED BY SMALL APERTURE IN CASE OF  
STRONGLY ASTIGMATIC BEAM A67-14416
- ROM-KRICHEVSKAIA, I. A.  
UNCOUPLED INTENSITY PEAKS IN LASER EMISSION A67-13132
- EMISSION LOSSES IN SOLID STATE LASER RESONATOR  
CALCULATED FOR ND GLASS LASER A67-13133
- ROMANOV, G. S.  
LASER RADIATION EFFECT ON METALS, NOTING  
DISINTEGRATION MECHANISM, INDENTATION FORMATION  
AND VAPOR FORMATION A66-39763
- RONCHI, L.  
LASER RADIATION COHERENCE PROPERTY DETERIORATION  
AND MOLECULAR SCATTERING DURING PROPAGATION  
THROUGH TURBULENT ATMOSPHERE A66-27131
- THEORY OF STEADY MULTIMODE OSCILLATION OF SOLID  
STATE LASER EXTENDED TO CAVITIES WITH INEFFICIENT  
END MIRRORS OR LOSSES DEPENDENT ON FREQUENCY A66-41274
- MULTIMODE OSCILLATIONS OF SOLID STATE LASER UNDER  
STATIONARY CONDITIONS EXTENDED TO TREAT CAVITIES  
WITH LOSSY END MIRRORS OR WITH FREQUENCY  
DEPENDENT LOSSES A66-33524
- AFCL-66-384
- TIME BEHAVIOR OF LIGHT EMITTED FROM MANY-ELEMENT  
LASER - MICROWAVE MODELS OF LASER RESONATORS  
ASR-1 A67-10283
- ROSS, D. L.  
DEUTERIUM ISOTOPE EFFECT ON THRESHOLDS OF EUROPIUM  
CHELATE LASERS, NOTING SOLVENT THERMAL EFFECTS A66-26598
- ROSS, M.  
BOOK ON LASER RECEIVERS COVERING NOISE  
PERFORMANCE, ATMOSPHERIC EFFECTS, DETECTION  
TECHNIQUES, HARDWARE AND SYSTEMS AVAILABLE,  
OPTICAL COMMUNICATION IN VISIBLE AND IR SPECTRUM,  
ETC A66-36060
- ROSSI, J. A.  
OPTICAL PUMPING WITH DIODE LASER INTO FABRY-  
PEROT RESONATOR FACE OF THIN HIGHLY-ABSORBING  
SEMICONDUCTOR, NOTING VARIABLE MODE SPACING  
INCLUDING SINGLE MODE OUTPUT A67-10879
- ROSTAS, F.  
LASERS USED TO EXTEND RF PLASMA DIAGNOSTIC  
PROCEDURES TO OPTICAL FREQUENCIES BY  
INTERFEROMETRIC AND THOMSON DIFFUSION METHODS A67-13474
- ROTH, C.  
THERMALLY-INDUCED OPTICAL PATH DISTORTIONS IN  
LASER RODS MEASURED BY OBTAINING TIME RESOLVED  
INTERFEROGRAMS, USING MACH-ZEHNDER  
INTERFEROMETER AND Q-SWITCHED LASER A66-25994
- DYNAMIC OPTICAL PATH DISTORTION IN RUBY AND  
NEODYMIUM DOPED GLASS LASER RODS DUE TO  
EVOLUTION OF THERMAL GRADIENTS DURING OPTICAL  
PUMPING CYCLE A66-28554
- ROTH, D.  
CHROMIUM-DOPED RUTILE SUITABILITY AS ACTIVE  
MATERIAL IN SOLID STATE MASER RESONATOR A67-10246
- ROTHE, H.  
INTRINSIC NOISE TEMPERATURE MEASUREMENT IN  
REFLECTION TYPE CAVITY MASER A67-17892
- ROULIER, A.  
THRESHOLD DETERMINATION OF PULSED RUBY LASER BY  
SINGLE PULSE TECHNIQUE A66-37548
- ROULOT, M.  
IR LASER RADIATION WITH POWER OF 5.7 WATTS IN  
VICINITY OF 10.69 MU IN SEALED TUBE CONTAINING  
PURE CARBON DIOXIDE EXCITED BY AC OR DC CURRENT A66-25410
- ROWLEY, R. S.  
LASER TV SYSTEM OPERATION, PERFORMANCE  
CHARACTERISTICS AND APPLICATION A66-37743
- ROWLEY, W. R. C.  
UNMODULATED LASER OUTPUT AT CONTROLLED FREQUENCY,  
USING CORRECTING BEATS FROM REFERENCE LASER A66-30205
- ROZANOV, N. N.  
NONLINEAR ZEEMAN EFFECT FOR GAS LASER A66-34181
- RUBANOV, A. S.  
RADIATION NOISE EFFECT ON LASER OPTICAL  
PROPERTIES, NOTING DENSITY VS RESONATOR  
CHARACTERISTICS, ENERGY SPECTRUM, ETC A66-40917

- RUBIN, J. J.  
YTTRIUM VANADATE CRYSTALS GROWN AND PROCESSED  
FOR OPTICAL PURPOSES A66-35434
- RUBINOV, A. N.  
MATHEMATICAL FORMULAS TO DETERMINE RADIATION  
LOSS MEASUREMENT IN RUBY LASER  
TG-230-T468 N66-34235
- RUDENKO, V. K.  
SINGLE MODE APPROXIMATION OF PARAMETRIC EXCITATION  
AND SELF-EXCITATION OF OSCILLATIONS IN FABRY-  
PEROT RESONATOR FILLED WITH NONLINEAR DISPERSIVE  
MEDIUM A67-11575
- RUDENKO, V. N.  
THERMAL EFFECTS IN VARIOUS MEDIA DUE TO LASER BEAM  
A66-29209  
THERMAL EFFECTS IN VARIOUS MEDIA DUE TO LASER BEAM  
A66-33058
- RUDKO, R. I.  
UPPER LASER STATES DERIVING POPULATION THROUGH  
CASCADE TRANSITIONS FROM HIGHER LAYER STATES OF  
ARGON ION NOTING CONSISTENCY OF LASER OUTPUT  
CURRENT DEPENDENCE WITH CURRENT DEPENDENCE OF  
CASCADE RATE A66-37774  
RELATIVE INTENSITIES AND CASCADE TRANSITION RATIO  
IN CW AR II LASER NEAR 4103.9 ANGSTROMS  
A67-19560
- RUDLIN, L.  
Q-SWITCHED RUBY LASER USED TO EXPLODE PSEUDO-AIR  
TARGETS  
NOLTR-65-152 N66-29965
- RUGARI, A. D.  
LARGE SCREEN REAL TIME PROJECTION DISPLAY  
TECHNIQUE USING NE- HE GAS LASER  
A66-31412
- RUNDLE, W. J.  
FABRICATION OF GALLIUM ARSENIDE LASER DIODES BY  
DIFFUSION  
AD-478538 N66-28726
- RUPF, K.  
INTRINSIC NOISE TEMPERATURE MEASUREMENT IN  
REFLECTION TYPE CAVITY MASER A67-17892
- RUPPRECHT, H.  
SPONTANEOUS AND STIMULATED EMISSION FROM GaAs  
DIODES WITH THREE-LAYER STRUCTURES CONSISTING OF  
N-N-P, N-I-P OR N-P-P DIODES A66-40102
- RUSBUELDT, D.  
FARADAY ROTATION MEASUREMENT OF TRAPPED MAGNETIC  
FIELDS IN THETA PINCH PLASMA, USING GAS LASER BEAM  
A67-17447
- RUSCIO, J. T.  
PHASE LOCKED LASER LOOP FOR AMPLITUDE AND PHASE  
MEASURING DEVICE FOR COHERENT OPTICAL WAVE FRONTS  
A67-15076
- RUSHWORTH, P. M.  
FISSION OR RADIOISOTOPIC NUCLEAR RADIATION APPLIED  
TO LASER PUMPING, DISCUSSING FORMS, SOURCES,  
POWER, SOLID STATE AND MOLECULAR GAS LASERS,  
ENERGY TRANSFER, OPTICAL FLUORESCENCE AND CUT-OFF  
PHENOMENON A67-16547
- RUSOV, V. M.  
PRESSURE DEPENDENCE OF OUTPUT POWER OF HE- NE  
LASER ON AMPLITUDE OF PERIODIC HIGH VOLTAGE  
EXCITATION PULSES A67-18784
- RUTKOVSKII, F. K.  
DISTRIBUTION OF PUMPING RADIATION DENSITY IN  
TRIANGULAR PRISM LASER RESONATOR BY GEOMETRICAL  
OPTICS  
TG-230-T476 N66-34774
- RYAN, J. R.  
LASER MICROPROBE USED TO STUDY SMALL INCLUSIONS IN  
METALS A67-15461
- RYKALIN, N. M.  
TEMPERATURE DISTRIBUTION IN BILAYER SHEET DURING  
WELDING WITH LASER BEAM  
JPRS-37856 N66-39411
- RYKALIN, N. N.  
HEATING PROCESS IN LASER WELDING OF METAL SHEETS,  
TAKING INTO ACCOUNT ENERGY DISTRIBUTION, HEAT  
TRANSFER AND FLUX DENSITIES A66-29989  
TEMPERATURE DISTRIBUTION IN TWO-LAYER PLATE DURING  
WELDING BY LASER LIGHT FLUX A66-40194  
TEMPERATURE DISTRIBUTION IN TWO-LAYER PLATE  
DURING WELDING BY LASER LIGHT FLUX  
A67-17548
- RYMARCHUK, I. A.  
RADIATIVE POWER AMPLIFICATION OF HE- NE LASER  
WITH NEARLY CONFOCAL RESONATORS A66-41453  
RADIATIVE POWER AMPLIFICATION OF HE- NE LASER  
WITH NEARLY CONFOCAL RESONATORS  
A67-14190
- RYVKIN, S. M.  
DISINTEGRATION OF ALKALI HALIDE SINGLE CRYSTALS,  
POLYMERS AND GLASSES UNDER LASER RADIATION, NOTING  
PARAMETERS OF DISINTEGRATION REGION MAGNITUDE  
A66-34681  
LASER BEAM EFFECT ON HYDRODYNAMIC BEARINGS,  
DISCUSSING MICROCRACKS AND CRITICAL ENERGY,  
EXPLAINING BREAKDOWNS A66-41409  
LI F SINGLE CRYSTAL DESTRUCTION AS FUNCTION OF  
LASER BEAM ENERGY, EXAMINING DISLOCATION PATTERN  
ARISING FROM CRACK PROPAGATION A67-10071  
POLYMETHYLMETHACRYLATE AND POLYSTYRENE EXPOSURE  
TO RUBY AND NEODYMIUM-GLASS LASER RADIATION,  
NOTING APPEARANCE OF EPR A67-10075  
DISINTEGRATION OF ALKALI HALIDE SINGLE CRYSTALS,  
POLYMERS AND GLASSES UNDER LASER RADIATION, NOTING  
PARAMETERS OF DISINTEGRATION REGION MAGNITUDE  
A67-14367
- S
- SABBAGH, H. A.  
MASER SPIN DYNAMICS  
NASA-TM-X-55675 N67-18747
- SABISKY, E. S.  
SOLID STATE CW OPTICALLY PUMPED MICROWAVE MASER,  
USING DIVALENT THULIUM DOPED CALCIUM FLUORIDE  
A66-33614
- SACCHI, C. A.  
EXPERIMENTAL OBSERVATION OF REGULAR SPIKING IN  
NEODYMIUM DOPED GLASS LASER ROD ATTRIBUTED TO  
SIMULTANEOUS OSCILLATION OF MANY TRANSVERSE AND  
LONGITUDINAL MODES A66-28727  
SINGLE TRANSVERSE AND LONGITUDINAL MODES OBSERVED  
IN OUTPUT OF PASSIVE Q-SWITCHED RUBY LASER WHEN  
TWO SPHERICAL MIRRORS ARE USED FOR RESONATOR  
A66-42563
- SACKS, B.  
HIGH MAGNETIC FIELD EFFECT ON INTERBAND  
SEMICONDUCTOR LASER, PARTICULARLY ELECTROMAGNETIC  
MODES AND COUPLING AND THRESHOLD CURRENT  
CONDITIONS A67-16673
- SAITO, S.  
DEMODULATION METHOD IN WHICH PHASE MODULATION OF  
LASER BEAM IS CONVERTED TO AMPLITUDE MODULATION  
BY AUTOCORRELATION A66-30616  
CURRENT MEASURING DEVICE FOR EHV TRANSMISSION  
LINE, OBTAINING INSTANTANEOUS MAGNETIC FIELD BY  
GAUGING FARADAY ROTATION ANGLE OF LASER BEAM IN  
FLINT GLASS ROD A66-42556
- SAKAI, Y.  
LASER OSCILLATION WITH TOTALLY REFLECTING ROOF

- PRISM AS CAVITY, NOTING OUTPUT VS MIRROR ALIGNMENT  
FOR TWO ROTATION AXES A66-29414
- SAKURAI, K.  
HYPERFINE SPECTRUM OF XENON IN 3.5 MM MASER  
TRANSITION NOTING EXPERIMENTAL SETUP, GAIN  
PROFILES FOR VARIOUS INPUT POWER LEVELS AND  
STRUCTURAL PROPERTIES A66-38763
- MAGNETICALLY TUNABLE IR MASERS OF HELIUM-XENON,  
CONSIDERING EXPERIMENTAL PROBLEM IN APPLYING  
TUNABLE IR MASER TO IR SPECTROSCOPY A67-14764
- SALMANOV, V. M.  
DISINTEGRATION OF ALKALI HALIDE SINGLE CRYSTALS,  
POLYMERS AND GLASSES UNDER LASER RADIATION, NOTING  
PARAMETERS OF DISINTEGRATION REGION MAGNITUDE A66-34681
- LASER BEAM EFFECT ON HYDRODYNAMIC BEARINGS,  
DISCUSSING MICROCRACKS AND CRITICAL ENERGY,  
EXPLAINING BREAKDOWNS A66-41409
- LI F SINGLE CRYSTAL DESTRUCTION AS FUNCTION OF  
LASER BEAM ENERGY, EXAMINING DISLOCATION PATTERN  
ARISING FROM CRACK PROPAGATION A67-10071
- POLYMETHYLMETHACRYLATE AND POLYSTYRENE EXPOSURE  
TO RUBY AND NEODYMIUM-GLASS LASER RADIATION,  
NOTING APPEARANCE OF EPR A67-10075
- DISINTEGRATION OF ALKALI HALIDE SINGLE CRYSTALS,  
POLYMERS AND GLASSES UNDER LASER RADIATION, NOTING  
PARAMETERS OF DISINTEGRATION REGION MAGNITUDE A67-14367
- KINETICS OF FORMATION AND HEALING OF DAMAGE CAUSED  
BY LASER PULSE IN LITHIUM FLUORIDE SINGLE CRYSTALS A67-17057
- SALOW, H.  
TIME VARIATION IN INTENSITY OF LIGHT EMITTED FROM  
CW GA AS LASER DIODES A67-10243
- SALPETER, E. E.  
STIMULATED EMISSION PROCESSES INTERPRETING OH  
MICROWAVE EMISSION FROM POINTS IN SKY, USING  
ANISOTROPIC UV RADIATION WHICH LEADS TO  
MOLECULE ALIGNMENT AND POPULATION INVERSION A66-37343
- SAMELSON, H.  
ORGANIC LASER SYSTEMS INCLUDING LUMINESCENCE FOR  
ACHIEVING LASER ACTION, FLUORESCENT AND  
PHOSPHORESCENT SYSTEMS AND CHEMISTRY AND  
SPECTROSCOPIC PROPERTIES OF RARE EARTH CHELATES A66-36970
- PHYSICAL PROPERTIES AND OPERATING CHARACTERISTICS  
OF EUROPIUM AND RARE EARTH CHELATE LASERS  
TR-66-052.13 N67-12533
- SAMPLE, S. B.  
DATA RECORDING AND PROCESSING SYSTEMS FOR GT-7  
LASER COMMUNICATOR EXPERIMENT - LASER WAVE  
SCATTERING DUE TO REFRACTIVE INDEX PERTURBATIONS  
IN PROPAGATING MEDIUM NASA-CR-65553 N66-39966
- SAMPSON, D. F.  
LASER LINES DUE TO ENERGY TRANSFER FROM COLOR  
CENTERS TO ERBIUM IONS IN CALCIUM FLUORIDE  
CRYSTALS IRRADIATED BY GAMMA RAY A66-30278
- SAMSON, A. M.  
SPECTRAL WIDTH OF PEAK TYPE AND MONOPULSE TYPE  
RADIATION OF SOLID-BODY LASER IN NONSTATIONARY  
REGIME A66-42133
- FORMULAS FOR ANALYZING CHARACTERISTICS OF SINGLE-  
PULSE Q-SWITCHING LASER AS FUNCTION OF  
POPULATION INVERSION, PUMPING POWER, MIRROR  
REFLECTIVITY, AND PROPERTIES OF MEDIUM  
TG-230-T473 N66-37256
- SAMUEL, A. H.  
DIRECT-EXCITATION LIQUID LASER MEASURED FOR
- QUANTUM EFFICIENCY FLUORESCENCE  
AD-628526 N66-24728
- SANDFORD, M. C. W.  
UPPER ATMOSPHERIC LIGHT SCATTERING OF VERTICALLY  
FIRED RUBY-LASER PULSE A66-33348
- SAPUNOV, I. U. M.  
PERFORMANCE CHARACTERISTICS FOR PULSE TYPE AR  
LASER WITH EXTERNAL INTERFERENTIAL SYSTEM OF  
QUASI-CONFOCAL SPHERICAL MIRRORS A66-41452
- PERFORMANCE CHARACTERISTICS FOR PULSE TYPE AR  
LASER WITH EXTERNAL INTERFERENTIAL SYSTEM OF  
QUASI-CONFOCAL SPHERICAL MIRRORS A67-14188
- SARD, E.  
ULTRALOW-NOISE TUNABLE S-BAND AMPLIFIER USING  
TWM AS SECOND STAGE A67-10106
- SARGENT, M., III  
MULTIPLE QUANTUM EQUATIONS FOR MODE AMPLITUDE AND  
FREQUENCY DETERMINATION FOR MAGNETIC FIELD-TUNED  
GAS OPTICAL MASER A66-26200
- SARON, R.  
FREQUENCY SHIFT RELATIVE TO SPECTRAL WIDTH FOR  
SINGLE PULSES OF TRIGGERED LASER DETERMINED BY  
MEASURING VARIATIONS OF EMITTED WAVELENGTH AS  
FUNCTION OF TIME A66-32622
- SARZHEVSKII, A. M.  
MAXIMUM OUTPUT POWER FROM RUBY LASER AS FUNCTION  
OF PUMPING FOR SEVERAL INTERFEROMETER BASE  
VALUES TG-230-T479 N66-37072
- SAUERMAN, H.  
PHASE AND AMPLITUDE FLUCTUATION OF GAS AND SOLID  
STATE LASERS, ACCOUNTING FOR NOISE CAUSED BY  
PUMPING, INCOHERENT DECAY, LATTICE VIBRATIONS AND  
ATOMIC COLLISIONS A67-14949
- SAUNDERS, P. A. H.  
X UV C, TI, MN, FE, NI, CU, ZN AND AR LINE  
SPECTRA AND CONTINUUM RADIATION SPECTRA IN PLASMAS  
PRODUCED BY FOCUSED RUBY LASER BEAM A66-39812
- SAVCHENKO, M. M.  
FAST OVERLAP OF MICROWAVE RADIATION BY IONIZATION  
AUREOLE OF SPARK IN LASER BEAM A66-36719
- HALATION OF PHOTOIONIZATION OF LIGHT SPARK  
INVESTIGATED, USING SUPER HIGH FREQUENCY RADIO  
RADIATION, FOR RUBY LASER TT-66-61469 N66-34061
- SAVELEV, V. G.  
COMPUTER CALCULATIONS PERMITTING INVESTIGATION OF  
TIME CHARACTERISTICS OF RADIATION IN INVESTIGATION  
OF LASER WITH PASSIVE CELL A67-13962
- SAVELEV, V. S.  
SUBMILLIMETER WAVELENGTH ELECTRONIC DEVICES,  
EXAMINING DEVELOPMENT OF LASERS AND REFLECTED WAVE  
TUBES WITH OVERLAPPING EFFECTIVE WAVE RANGE A66-38004
- SUBMILLIMETER WAVELENGTH ELECTRONIC DEVICES,  
EXAMINING DEVELOPMENT OF LASERS AND REFLECTED WAVE  
TUBES WITH OVERLAPPING EFFECTIVE WAVE RANGE A67-17168
- SAVKIN, A. E.  
SUM RADIATION FREQUENCY GENERATION BY RUBY AND  
NEODYMIUM LASERS IN KDP CRYSTALS A67-19734
- SAVVA, V. A.  
FORMULAS FOR ANALYZING CHARACTERISTICS OF SINGLE-  
PULSE Q-SWITCHING LASER AS FUNCTION OF  
POPULATION INVERSION, PUMPING POWER, MIRROR  
REFLECTIVITY, AND PROPERTIES OF MEDIUM  
TG-230-T473 N66-37256

- SAVVINYKH, G. A.**  
RUBY LASER-INDUCED EFFECT OF PULSED PRESSURE ON  
KDP CRYSTAL SURFACE AND THERMAL BULK EFFECT ON  
EXCITATION OF ULTRASONIC OSCILLATION IN CRYSTAL  
A66-40318  
  
RUBY LASER FREQUENCY CONVERSION TECHNIQUE BY LASER  
BEAM SCATTERING AND MIXING OF COMBINED FREQUENCIES  
A67-13094
- SAYERS, M. D.**  
ONSET OF OSCILLATION IN HE- NE LASER ANALYZED  
USING LAMB THEORY, OBTAINING TIME CONSTANT VALUE  
FOR POPULATION OF LOWER LASER LEVEL  
A67-16821
- SBITNEV, E. A.**  
LEAD AZIDE AND PENTAERYTHRIT TETRANITRATE  
EXPLOSION TRIGGERED BY LASER RADIATION  
A67-19315
- SCHAEFER, E. M.**  
SELF-LOCKING MODES IN ARGON ION LASER, OBSERVING  
SUBNANOSECOND PULSATION OF LASER OUTPUT WITH  
WIDEBAND PHOTOMULTIPLIER  
A67-12503
- SCHAEFER, F. P.**  
PUMPING OF ORGANIC DYES IN ORGANIC SOLVENTS, USING  
PULSED RUBY LASER  
A67-12515
- SCHAFER, P. S.**  
MEASUREMENTS ON PHYSICAL AND LASER PROPERTIES OF  
VAPOR-GROWN RUBY SINGLE CRYSTALS PREPARED BY  
EPITAXIAL GROWTH  
A66-36081
- SCHANLOW, A. L.**  
ULTRAVIOLET RADIATION FOR RUBY LASER PUMPING, AND  
ENERGY TRANSFER PROCESSES BETWEEN ELECTRON  
ORBITS AND BETWEEN UNLIKE IONS  
ML-1393  
N66-24104
- SCHEGGI, A. M.**  
LASER RADIATION COHERENCE PROPERTY DETERIORATION  
AND MOLECULAR SCATTERING DURING PROPAGATION  
THROUGH TURBULENT ATMOSPHERE  
A66-27131  
  
EXPERIMENT WITH MICROWAVE OPEN RESONATOR OF  
FABRY- PEROT TYPE  
AFCL-66-496  
N66-38268  
  
TIME BEHAVIOR OF LIGHT EMITTED FROM MANY-ELEMENT  
LASER - MICROWAVE MODELS OF LASER RESONATORS  
ASR-1  
N67-10283
- SCHENCK, W. J.**  
MULTIPURPOSE ULTRAHIGH SPEED CAMERA SYSTEM, NOTING  
USE AS MONOSECOND KERR CELL, IMAGE CONVERTER AND  
GIANT LASER PULSE GENERATOR  
A66-41675
- SCHERMANN, J.-P.**  
VERY FINE-BEAMED MASER OSCILLATION PRODUCED IN  
ATOMIC HYDROGEN BY HF DISCHARGE OBSERVED BY  
DOUBLE FOCUSING TECHNIQUE  
A66-42993
- SCHIEL, E. J.**  
HIGH CURRENT SOLID STATE PULSER USED TO DRIVE  
INJECTION LASER FOR ROOM TEMPERATURE OPERATION  
ECOM-2753  
N67-15343
- SCHINITSCHEK, E. J.**  
RECIRCULATION OF LIQUID THROUGH CELL AND EXTERNAL  
HEAT EXCHANGER TO SOLVE PROBLEM OF REPEATED  
FLASHING IN EUROPIUM CHELATE LASERS  
A66-39108
- SCHINELLER, E. R.**  
ALL-SOLID WAVEGUIDE COMPONENTS FOR SLOT COUPLERS  
AND WAVEGUIDE LASER  
NASA-CR-76893  
N66-32757
- SCHLAFFER, J.**  
LASER BEAM DEFLECTION AND SCANNING TECHNIQUES  
A66-42817
- SCHLECHT, R. G.**  
PULSED ARC XENON DISCHARGES USED FOR OPTICAL  
PUMPING OF HIGH ENERGY LASERS  
AD-632892  
N66-31537
- SCHLOSSBERG, H. R.**  
OPTICAL- AND I R-MASER SPECTROSCOPY OF  
INHOMOGENEOUSLY BROADENED RESONANCES, USING GAS  
LASERS  
A66-26196  
  
NONLINEAR ATTENUATION OR GAIN CHARACTERISTICS OF  
DOPPLER-BROADENED ATOMIC RESONANCE INVOLVING  
LEVELS WITH SMALL SPLITTINGS, NOTING MODE COUPLING  
OF GAS LASER  
A67-10152  
  
GAS LASER SPECTROSCOPIC ANALYSIS OF HYPERFINE  
STRUCTURE, PARAMAGNETIC PROPERTIES, RADIATIVE  
LIFETIMES AND DOPPLER-BROADENED TRANSITION  
SATURATION BEHAVIOR OF EXCITED STATES OF Xe 129  
A67-15462
- SCHMACKPFEFFER, A.**  
RUBY LASER MODE LOCKING AND MODE COMPETITION USING  
RG-8 FILTER AS PASSIVE MODULATOR  
A67-20147
- SCHMID, CH.**  
PHASE AND AMPLITUDE FLUCTUATION OF GAS AND SOLID  
STATE LASERS, ACCOUNTING FOR NOISE CAUSED BY  
PUMPING, INCOHERENT DECAY, LATTICE VIBRATIONS AND  
ATOMIC COLLISIONS  
A67-14949
- SCHMIDT, H.**  
FORMATION OF MAGNETIC PINCH IN ELECTRON-HOLE  
PLASMA IN IN SB AND POSSIBILITY OF POPULATION  
INVERSION IN PINCH  
DI-82-0502  
N66-29169
- SCHMIDT, W.**  
PUMPING OF ORGANIC DYES IN ORGANIC SOLVENTS, USING  
PULSED RUBY LASER  
A67-12515
- SCHMIED, C.**  
FOKKER- PLANCK EQUATION APPLIED TO LASER UNDER  
INFLUENCE OF QUANTUM FLUCTUATIONS CONNECTED WITH  
DISSIPATION, PUMPING AND CAVITY THERMAL NOISE,  
NOTING DISTRIBUTION AND CORRELATION FUNCTION  
A66-38930
- SCHOLLMEIER, G.**  
MASER MATERIAL IRON DOPED RUTILE, EXAMINING  
THEORETICAL AND EXPERIMENTAL DISAGREEMENT IN SPIN  
HAMILTONIAN DESCRIBING PARAMAGNETIC BEHAVIOR  
A66-29027  
  
CHROMIUM-DOPED RUTILE SUITABILITY AS ACTIVE  
MATERIAL IN SOLID STATE MASER RESONATOR  
A67-10246
- SCHOTLAND, R. M.**  
THERMALLY TUNED RUBY LASER RADAR FOR DETERMINING  
VERTICAL PROFILE OF ATMOSPHERIC WATER VAPOR  
TR-66-9  
N66-35539  
  
MEASUREMENT AND THEORY, INCLUDING SIGNAL TO NOISE  
AND TRANSFER FUNCTION CALCULATIONS, OF  
ATMOSPHERIC WATER VAPOR USING RUBY LASER OPTICAL  
RADAR  
N67-13488
- SCHULTE, H. J.**  
MODE LOCKING IN GASEOUS LASER WHOSE CAVITY IS  
LENGTH MODULATED AT MODE SEPARATION FREQUENCY  
A66-31095
- SCHULZ-DUBOIS, E. O.**  
RING LASER ROTATION RATE SENSOR NOTING RELATION TO  
ELECTROMAGNETIC RADIATION  
A66-42564
- SCHWAB, F.**  
LIGHT SCATTERING TECHNIQUES FOR CRYSTAL EVALUATION  
AFCL-66-119  
N66-26436
- SCHWARTZ, J.**  
FERROELECTRIC MATERIALS FOR LIGAND FIELD MASER  
IN MILLIMETER RANGE - LIGAND FIELD NEAR GROUND  
STATE CROSSEOVERS MEASURED BY OPTICAL AND  
MICROWAVE SPECTROSCOPY  
MC-64-102-R2  
N66-39741
- SCHWARZ, S. E.**  
SELECTIVE FEEDBACK AND SATURATION MECHANISMS OF  
RAMAN LASERS USING SECONDARY RAMAN LINES,  
EMPHASIZING CYCLOHEXANE  
A66-37777



- WAVE INTERACTION IN SATURABLE ABSORBERS, NOTING  
HOLE BURNING IN DYE SWITCHED RUBY LASER A67-20094
- SCHWINGHAMER, R. J.  
SUPERPOWER LASERS AND MAGNETIC FIELD TOOLS FOR USE  
IN DRILLING AND WELDING N66-36423
- SCOTT, B. F.  
NICKEL-COPPER CONE CALORIMETER DESIGN AND  
FABRICATION FOR LASER ENERGY MEASUREMENTS A67-10193
- LASER PULSE ENERGY MEASUREMENTS WITH LIQUID  
ABSORPTION CELL CALORIMETER A67-15456
- SCRIBNER, B. F.  
SPECTROCHEMICAL ANALYSIS OF SOLID SPECIMEN FROM  
VAPOR FORMED BY LASER BEAM AND EXCITED BY SPARK  
DISCHARGE A67-16786
- SCULLY, M.  
QUANTUM THEORY OF LASER HAVING ONLY SINGLE-MODE  
OSCILLATION AND IGNORING ATOMIC MOTION AND SPATIAL  
VARIATIONS IN CAVITY MODE A66-29117
- SEDELNIKOV, V. A.  
OUTPUT POWER OF CW LASER MEASURED BY WIRE  
BOLOMETER IN FORM OF PLANE SINGLE-LAYER SPIRAL AS  
SENSITIVE ELEMENT A66-35321
- SEDYKH, V. M.  
TWO-FREQUENCY VOLUME RESONATOR WITH INDEPENDENT  
TUNING WITHIN WIDE FREQUENCY BAND A67-11911
- SEHR, R. A.  
FABRICATION OF GALLIUM ARSENIDE LASER DIODES BY  
DIFFUSION AD-478538 N66-28726
- SEIDMAN, J. B.  
C AT DETECTION FROM DOPPLER SHIFT IN LASER LIGHT  
BACKSCATTERED FROM ATMOSPHERIC AEROSOL A66-28930
- SEIFERT, G.  
KERR CELL PROPERTIES NOTING FOUR-ELECTRODE CELL  
GIVING FREQUENCY SHIFT OF 60 MC FOR LASER BEAM A67-19552
- SEIFERT, H. S.  
PARTICLE VELOCITY IN GAS PARTICLE TWO-PHASE NOZZLE  
EXPANSION USING GAS LASER AND FABRY-PEROT  
INTERFEROMETER FOR ROCKET ENGINE PROPULSION  
AIAA PAPER 66-522 A66-31500
- SEIGEL, L.  
HE-NE LASER HOMODYNE SPECTROMETER OBSERVATION OF  
BROADENING OF SPECTRAL PROFILE OF LIGHT SCATTERED  
FROM CARBON DIOXIDE NEAR CRITICAL TEMPERATURE AND  
DENSITY DUE TO DENSITY FLUCTUATIONS A66-26168
- SEIGER, H. N.  
BIPOLAR NI-CD CELLS FOR RUBY LASERS AND POWER  
SOURCES TO YIELD HIGH ENERGY PULSES FOR FIRING  
PYROTECHNIC DEVICES A66-41760
- SELDEN, A. C.  
HIGH POWER CONTINUOUS WAVE FOUR-LEVEL SOLID  
NEODYMIUM GLASS LASER SHOWING LENGTH AND HOST LOSS  
AS DOMINANT FACTORS IN LIMITING OUTPUT POWER A66-33334
- SILIVANENKO, A. S.  
TWO-QUANTA ABSORPTION AND SCATTERING LOSS IN  
POWERFUL LASER A66-29350
- TWO-QUANTA ABSORPTION AND SCATTERING LOSS IN  
POWERFUL LASER A66-37355
- POWERFUL LASER EMPLOYING INDUCED TWO-QUANTA  
LUMINESCENCE A66-39771
- POWERFUL LASER EMPLOYING INDUCED TWO-QUANTA  
LUMINESCENCE A67-12856
- SEMEV, A. S.  
OPTICAL COUPLING USING GALLIUM ARSENIDE LASER FOR  
VARIATION OF FREQUENCY OF DIODE EMISSION THROUGH  
SMALL CHANGE IN CURRENT DENSITY A66-38920
- CURRENT INJECTION EFFECT ON TIME DELAY OF GA AS  
LASER RADIATION A67-10083
- OPTICAL COUPLING USING GALLIUM ARSENIDE LASER FOR  
VARIATION OF FREQUENCY OF DIODE EMISSION THROUGH  
SMALL CHANGE IN CURRENT DENSITY A67-16390
- SEMATSKII, I. V.  
RADIATION OF GIANT PULSES OF SUPERLUMINESCENCE BY  
HIGHLY EXCITED ACTIVE MEDIUM OF ND GLASS WITH  
RAPID CUT-IN OF AMPLIFICATION A66-42755
- RADIATION OF GIANT PULSES OF SUPERLUMINESCENCE BY  
HIGHLY EXCITED ACTIVE MEDIUM OF ND GLASS WITH  
RAPID CUT-IN OF AMPLIFICATION A67-10837
- SEMF, H. R.  
HIGH POWER VISIBLE CW GAS LASER BEAM GENERATION,  
MODULATION AND DEFLECTION FOR APPLICATION TO  
VISUAL DISPLAY TECHNOLOGY SMPT PREPRINT 100-6 A67-13801
- LASER DISPLAYS APPLICATION, PERFORMANCE AND STATUS  
OF EXISTING DEVICES A67-17887
- SEREBRIAKOV, V. A.  
FAST-ACTING FLUID SEAL FOR Q-FACTOR MODULATION OF  
NEODYMIUM GLASS LASER A66-27595
- IONIZATION OF AIR WITH LASER RADIATION IN SPIKE  
MODE A66-31150
- FAST-ACTING FLUID SEAL FOR Q-FACTOR MODULATION OF  
NEODYMIUM GLASS LASER A66-42729
- SEROV, R. V.  
MAGNETIC DIPOLE MOMENT IN SPARK PRODUCED BY  
FOCUSING LASER RADIATION A66-43055
- SETTE, D.  
FIRST AND SECOND ORDER CORRELATION FUNCTIONS FOR  
FIELD OBTAINED BY SUPERPOSITION OF TWO LASER MODES  
THROUGH YOUNGS EXPERIMENT, USED TO DETERMINE  
COHERENCE AND STATISTICAL PROPERTIES A67-12634
- SHAHAM, Y. J.  
LASER BEAM DETERIORATION AND STIMULATED RAMAN  
EFFECT AD-628074 N66-24738
- SHAJENKO, P.  
DOUBLE PULSE PUMPING OF RUBY LASERS FOR  
IMPROVEMENT OF LASER PERFORMANCE AND EFFICIENCY  
SA-TR20-9301 N66-35622
- SHALASHOV, V. A.  
TREATMENT OF STEEL WITH LASER BEAM, OBTAINING  
PRECISION HOLES WITHOUT AFFECTING MICROHARDNESS OF  
METAL A67-18234
- SHAMFAROV, I. A. L.  
TWO-LEVEL RESONATOR TYPE LASER USING NEUTRON-  
IRRADIATED QUARTZ SINGLE CRYSTAL WITH HIGH  
RECURRENT INVERSION FREQUENCY A67-15158
- SHAPERO, D. C.  
MULTIPLE STIMULATED BRILLOUIN EMISSION EXHIBITED  
BY LIQUIDS EXPOSED TO PULSED RUBY LASER, NOTING  
SCATTERING EVENTS, STOKES ORDERS IDENTIFICATION  
AND ITERATION MECHANISM A66-26164
- SHARMA, D. P.  
HEAT TRANSFER AND STRESS WAVE EVOLUTION PRIOR TO  
ABLATION AND THERMAL EQUILIBRIUM IN EXPOSURE OF  
SOLID AND LIQUID MATERIALS TO LASER SOURCES A66-32638
- SHATBERASHVILI, O. B.  
GIANT PULSE GENERATION RANGE IN TRANSVERSE  
DIRECTION AFTER Q-SWITCHING IN RUBY LASER,  
EXAMINING RESONATOR PROPERTIES A66-42516

- SHAW, D. A.  
SCANNING ELECTRON MICROSCOPE TO EXAMINE CRYSTAL  
MOSAIC STRUCTURES AND LASING PROPERTIES OF GALLIUM  
ARSENIDE LASER DIODES A66-33300
- SHCHEGLOV, V. A.  
NATURAL MODES OF PLANE AND CYLINDRICAL DIELECTRIC  
RESONATORS IN OPTICAL BAND A66-26042
- LASER OPERATED WITH SATURABLE FILTER FOR Q-  
SWITCHING, NOTING TWO MODES OF EXCITATION /SOFT  
AND HARD REGIME/ A66-32314
- OPTICAL COUPLING USING GALLIUM ARSENIDE LASER FOR  
VARIATION OF FREQUENCY OF DIODE EMISSION THROUGH  
SMALL CHANGE IN CURRENT DENSITY A66-38920
- HIGH FREQUENCY-STABILITY EM WAVE SOURCE, APPLYING  
THERMAL EXCITATION METHODS TO PENCIL QUANTUM  
GENERATOR IN IR REGION A66-39336
- HIGH FREQUENCY-STABILITY EM WAVE SOURCE, APPLYING  
THERMAL EXCITATION METHODS TO PENCIL QUANTUM  
GENERATOR IN IR REGION A66-39706
- OPTICAL COUPLING USING GALLIUM ARSENIDE LASER FOR  
VARIATION OF FREQUENCY OF DIODE EMISSION THROUGH  
SMALL CHANGE IN CURRENT DENSITY A67-16390
- THERMALLY EXCITED INFRARED BEAM LASER USING  
CARBON DIOXIDE, NITROGEN OXIDE, AND HYDROCYANIC  
ACID MOLECULAR ENERGY LEVELS  
ATD-66-102 N67-15769
- SHCHELEV, M. IA.  
DYNAMICS OF FIELD AND GENERATION FREQUENCIES IN  
GIANT PULSE OF RUBY LASER WITH PASSIVE SHUTTER,  
USING SOLUTION OF CRYPTOCYANINE IN ETHANOL, NOTING  
MIRROR REFLECTION COEFFICIENT A66-29727
- SHE, C. Y.  
ABSORBER CONCENTRATION EFFECT ON PULSED LASER  
SYSTEM NOTING PERFORMANCE CHARACTERISTICS,  
THRESHOLD ENERGY, PUMPING DYNAMICS AND TIME  
PARAMETERS A66-42254
- SHECHET, M. L.  
COHERENT TRANSMISSION OF OPTICAL RADAR FROM LASER  
SOURCE AND USE OF RF SUBCARRIERS PLACED ON  
OPTICAL BEAMS FOR WIDEBAND COMMUNICATIONS PURPOSES  
A66-28404
- SHELEPIN, L. A.  
DEVELOPMENT OF OPTICAL QUANTUM GENERATOR FROM  
HIGHLY IONIZED LOW TEMPERATURE TO CONVERT HEAT  
ENERGY INTO ELECTRIC AND COHERENT LIGHT  
RADIATION ENERGIES FOR USE IN LASER  
JPRS-39659 N67-18113
- SHEN, Y. R.  
LASER BEAM DETERIORATION AND STIMULATED RAMAN  
EFFECT  
AD-628074 N66-24738
- SHEREMETEV, A. G.  
BOOK ON LASER APPLICATIONS IN RADIO COMMUNICATION  
SYSTEMS A66-43226
- SHERMAN, G. C.  
PHOTOGRAPHIC COPIES OF HOLOGRAMS TAKEN WITH LASER  
LIGHT NOTING FILM, LIGHT SOURCE, DIRECTIONAL  
EFFECT, PROCESSING, ETC A66-26000
- SHERMAN, J. B.  
LASER RADAR RANGING SYSTEM USING PSEUDORANDOM CODE  
MODULATION, CONSIDERING APPLICATION TO PULSE AND  
DIGITAL CIRCUITRY, STATISTICAL COMMUNICATION  
THEORY AND ELECTRO-OPTICAL ENGINEERING  
A66-33557
- SHERONOV, A. A.  
GALLIUM ARSENIDE P-N JUNCTION LASER DIODE,  
INJECTION CURRENT DISTRIBUTION, DENSITY AND  
EMISSION SPECTRA VARIATION A66-25934
- OPTICALLY CONNECTED LASER CONSTRUCTED ON GALLIUM  
ARSENIDE P-N JUNCTION, NOTING COHERENT RADIATION
- SHIMIZU, F.  
STIMULATED STOKES EMISSIONS FROM RAMAN ACTIVE  
MEDIA OBSERVED BY USING Q-SWITCHED RUBY LASER  
WHICH EMITS MULTIPLE PULSE IN EACH SHOT A67-14765
- SHIMIZU, Y.  
STIMULATED STOKES EMISSIONS FROM RAMAN ACTIVE  
MEDIA OBSERVED BY USING Q-SWITCHED RUBY LASER  
WHICH EMITS MULTIPLE PULSE IN EACH SHOT A67-14765
- SHINODA, K.  
ANGULAR DISTRIBUTION OF STIMULATED RAMAN  
RADIATION, DISCUSSING AXIAL AND OFF-AXIAL STOKES  
AND SURFACE RADIATION MECHANISM A66-25189
- I R MASER ACTION ON VIBRATIONAL TRANSITIONS OF  
THERMALLY PUMPED POLYATOMIC MOLECULES A66-26203
- HYPERFINE SPECTRUM OF XENON IN 3.5 MM MASER  
TRANSITION NOTING EXPERIMENTAL SETUP, GAIN  
PROFILES FOR VARIOUS INPUT POWER LEVELS AND  
STRUCTURAL PROPERTIES A66-38763
- MAGNETICALLY TUNABLE IR MASERS OF HELIUM-XENON,  
CONSIDERING EXPERIMENTAL PROBLEM IN APPLYING  
TUNABLE IR MASER TO IR SPECTROSCOPY A67-14764
- SHINADA, M.  
THEORETICAL EXCITED STATE ABSORPTION SPECTRUM OF  
ELECTRON TRANSITIONS IN OPTICALLY PUMPED RUBY  
LASER A66-39570
- SHIPMAN, J. D.  
ION LASER EXPERIMENTS, MOLECULAR NITROGEN LASER,  
AND GAS LASER THEORY N67-12649
- SHIPMAN, J. D., JR.  
TRAVELING WAVE EXCITATION OF HIGH POWER NITROGEN  
AND NEON LASERS WITH VELOCITY MATCHING THAT OF  
STIMULATED EMISSION A67-20093
- SHIPULO, G. P.  
RUBY LASER RADIATION EFFECT ON FLUORESCENCE AND  
LASER ACTION IN DYSPROSIUM DOPED CALCIUM FLUORIDE  
CRYSTALS A66-37656
- SHISHKEVISH, C.  
RUBY LASER WITH NONRESONANT FEEDBACK BY USING  
VOLUME OR SURFACE SCATTERER N66-28924
- LASER ACTION BY RAPID ELECTRON COOLING OF IONIZED  
DENSE HYDROGEN PLASMA N66-32700
- SHKLOVER, L. P.  
RUBY LASER WITH LIQUID FILTER, CONSIDERING  
RELATION BETWEEN FILTER EFFICIENCY AND ABSORPTION  
CURVE PARAMETERS WHEN ACTING AS Q-FACTOR  
MODULATOR A67-12423
- SHKUNOV, N. V.  
RUBY AND NEODYMIUM GLASS LASERS SUM FREQUENCY  
GENERATION USING NONLINEAR ELECTRO-OPTICAL KDP  
CRYSTAL A67-17754
- SHOROKHOV, D. A.  
IONIZATION OF AIR WITH LASER RADIATION IN SPIKE  
MODE A66-31150
- SHOTOV, A. P.  
COHERENT RADIATION GENERATION IN ELECTRON-HOLE  
INDIUM ANTIMONIDE PLASMA, DISCUSSING EMISSION  
SPECTRUM A66-40319
- SPONTANEOUS AND INDUCED COHERENT RADIATION FROM  
INDIUM ANTIMONIDE ELECTRON-HOLE PLASMA A67-10088
- SHTYRKOV, E. I.  
CHARACTERISTICS OF PULSED LASER ACTION IN HE- NE  
AND HE- AR MIXTURES AT PRESSURES ABOVE 200 MM HG  
A67-14189

- SHUMIATSKII, P. S.  
MASER OSCILLATION INTENSITY AND FREQUENCY  
DEPENDENCE ON CONSTANT ELECTRIC AND MAGNETIC  
FIELDS ACTING ON MOLECULAR BEAM IN FRONT OF  
RESONATOR A67-10396
- SHVOM, E. M.  
RUBY LASER WITH LIQUID FILTER, CONSIDERING  
RELATION BETWEEN FILTER EFFICIENCY AND ABSORPTION  
CURVE PARAMETERS WHEN ACTING AS Q-FACTOR  
MODULATOR A67-12423
- SIDORENKO, L. K.  
CRYSTAL MOTION EFFECT ON TIME BEHAVIOR OF LASER  
GENERATION MODE, USING HIGH SPEED PHOTOGRAPHY AND  
OSCILLOGRAMS A66-29725
- SIEGMAN, A. E.  
OPTICAL HETERODYNE RECEIVER ANTENNA PROPERTIES,  
NOTING EFFECTIVE APERTURE OF CAPTURE CROSS SECTION  
VS DIRECTIONAL TOLERANCE AND DETECTION OF DOPPLER  
SHIFTS IN LIQUID SCATTERED COHERENT LIGHT A66-42809
- RADIO ELECTRONICS, DISCUSSING QUANTUM ELECTRONICS,  
LASERS, MICROWAVE DEVICES AND TECHNOLOGY, PLASMA  
PHYSICS, ETC A67-18072
- SILFVAST, W. T.  
LASER ACTION ON SEVERAL HYPERFINE TRANSITIONS IN  
MN I A66-34000
- PULSED LASER ACTION IN VISIBLE SPECTRUM OF SINGLY  
IONIZED GE, SN, PB, IN, CD AND ZN, LISTING  
TEMPERATURE AND PRESSURE RANGES A66-36076
- SILVERBERG, C. G.  
HOMOGENIZING METHODS FOR PLATINUM-FREE LASER  
GLASS, AND MELTING OF HIGH-PURITY LASER GLASS IN  
ALL-CERAMIC SYSTEM SATR-3 N66-30525
- SILVERMAN, D.  
COMMUNICATION SYSTEMS AT MICROWAVE AND OPTICAL  
FREQUENCIES FOR FUTURE MARS MISSIONS A66-33793
- SPACE COMMUNICATION REQUIREMENTS USING LASERS AND  
MICROWAVES IN MANNED MARS FLIGHTS A66-33794  
AIAA PAPER 65-324
- SIMONENKO, T. V.  
COHERENCE IN RADIATION PEAKS OF RUBY LASER STUDIED  
THROUGH INTERFERENCE FIELD A66-33510
- COHERENCE IN RADIATION PEAKS OF RUBY LASER STUDIED  
THROUGH INTERFERENCE FIELD A66-42124
- SIMPSON, J. H.  
CESIUM VAPOR USED FOR TRANSFORMER LASER TO BE  
OPTICALLY PUMPED BY BATTERY OF NEODYMIUM LASERS  
GPL-A-31-3 N66-33813
- SIMS, S. D.  
THERMALLY-INDUCED OPTICAL PATH DISTORTIONS IN  
LASER RODS MEASURED BY OBTAINING TIME RESOLVED  
INTERFEROGRAMS, USING MACH-ZEHNDER  
INTERFEROMETER AND Q-SWITCHED LASER A66-25994
- DYNAMIC OPTICAL PATH DISTORTION IN RUBY AND  
NEODYMIUM DOPED GLASS LASER RODS DUE TO  
EVOLUTION OF THERMAL GRADIENTS DURING OPTICAL  
PUMPING CYCLE N66-28554
- SINCLAIR, D. C.  
POLARIZATION CHARACTERISTICS OF IONIZED ARGON  
LASER IN MAGNETIC FIELD A67-18542
- SINGER, J. R.  
MAGNETICALLY COMPRESSED PLASMA AS HIGH INTENSITY  
SOURCE OF NEAR UV AND VISIBLE RADIATION  
EXPERIMENTALLY STUDIED IN DYNAMIC PINCH A67-11880
- SINGER, S. F.  
LIGHT BACKSCATTERING EXPERIMENT IN LASER PROBING  
STUDIES OF ATMOSPHERIC LAYER ABOVE 100 KM
- NASA-CR-74730 N66-24998
- SYSTEMS ANALYSES AND MODELS OF LASER TECHNIQUES  
DESIGNED TO DETECT INTERPLANETARY DUST IN  
ATMOSPHERE OF EARTH N67-13108  
NASA-CR-80473
- SIRKIS, M. D.  
OPTICAL PUMPING WITH DIODE LASER INTO FABRY-  
PEROT RESONATOR FACE OF THIN HIGHLY-ABSORBING  
SEMICONDUCTOR, NOTING VARIABLE MODE SPACING  
INCLUDING SINGLE MODE OUTPUT A67-10879
- SYNTHESIS, JUNCTION FABRICATION, AND LUMINESCENT  
OPERATION OF GALLIUM-ARSENIDE-PHOSPHIDE  
SEMICONDUCTORS A67-10879  
AFCRL-66-245 N66-36868
- JUNCTION EFFECTS IN COMPOUND SEMICONDUCTORS  
AFCRL-66-617 N67-15074
- SIZELOVE, J. R.  
TRANSLUCENT AND OPAQUE PHOTOCATHODES ANALYSIS  
A67-19408
- SKEEN, C. H.  
NEODYMIUM DOPED GLASS LASER USING SATURABLE LIQUID  
Q-SWITCH A66-41033
- SKIBARKO, A. P.  
MEASURING AMPLIFICATION OF COHERENT OPTICAL  
RADIATION IN NEON-HELIUM FILLED TUBE A66-33512
- MEASURING AMPLIFICATION OF COHERENT OPTICAL  
RADIATION IN NEON-HELIUM FILLED TUBE A66-42125
- SKINNER, D. R.  
MONTE CARLO TECHNIQUE TO DETERMINE TOTAL ENERGY  
AND ENERGY DISTRIBUTION IN LASER CRYSTAL DUE TO  
OPTICAL PUMPING A66-26028
- TRANSFER EFFICIENCY OF LASER PUMPING CAVITIES WITH  
DIFFUSELY REFLECTING WALL DETERMINED, BASED ON  
APPROXIMATELY ISOTROPIC NATURE OF LIGHT INSIDE  
CAVITY A66-35379
- SKINNER, J. G.  
PUMPING ENERGY DISTRIBUTION OF RUBY LASER,  
DISCUSSING EXISTENCE OF TRAPPED MODES AND EFFECT  
OF PARTIALLY FILLED WATER JACKET SURROUNDING RUBY  
RODS A66-35389
- SKLENAR, G.  
IMPULSE DISCHARGE TUBES FOR LASER EMPLOYING  
INDUSTRIAL GLASS A67-19506
- SKLIAROV, I. A.  
OUTPUT POWER OF CW LASER MEASURED BY WIRE  
BOLOMETER IN FORM OF PLANE SINGLE-LAYER SPIRAL AS  
SENSITIVE ELEMENT A66-35321
- SKLIZKOV, G. V.  
HEATING AND SCATTERING OF PLASMA PRODUCED BY  
GIANT LASER PULSE FOCUSED ON SOLID TARGET A67-14194
- GAS DYNAMIC EQUATIONS FOR DETERMINATION OF  
HEATING, VAPORIZATION AND EXPANSION OF SUBSTANCE  
DUE TO Q-SWITCHED LASER RADIATED COLLIMATES ONTO  
SURFACE OF SOLIDS A67-16652
- SKOLNICK, M. L.  
FREQUENCY STABILIZATION OF GAS LASER TO LOCK  
OUTPUT TO CENTER OF ATOMIC RESONANCE, USING ERROR  
SIGNAL A66-38241
- SKOMOROVSKII, I. A.  
RELAXATION TIME FOR RECOMBINATION RADIATION FROM  
SEMICONDUCTOR SOURCE DETERMINED BY MEASURING  
CURRENT/EMISSION PHASE SHIFT A66-29704
- SKOWRONEK, M.  
OPTICAL TRANSMISSION OF PLASMA COLUMN GENERATED BY  
IONIZED GAS EXPLOSION DETERMINED, USING LASER BEAM  
A66-42998

## SKURATOVA, N. V.

AXIAL MAGNETIC FIELD EFFECT ON NE- HE LASER POWER  
OUTPUT OPERATING IN REGIME OF SIMULTANEOUS  
GENERATION OF 3.39 AND 0.6328 MICRON LINES

A67-19601

## SKVORTSOV, V. A.

BEAM MASER EXCITATION PARAMETER CALCULATIONS  
INCLUDING COLLISION IN BEAM EFFECTS AND COMPARISON  
WITH MOLECULAR FORMALDEHYDE

A66-26054

MOLECULE REORIENTATION AND TRANSITION PROBABILITY  
IN MOLECULAR BEAM MASER USING FORMALDEHYDE

A66-39662

## SLAMA, L.

PRODUCTION OF NEUTRAL OR IONIZED GAS PLASMOIDS BY  
FOCUSING BEAM OF COHERENT LIGHT EMITTED BY RUBY  
LASER ON TARGET OF PURE METAL OR METAL CONTAINING  
GAS

A66-26819

LASER BEAM TECHNIQUES FOR STUDY OF PLASMAS WITH  
HIGH ELECTRON DENSITIES

A66-26822

## SLATTERY, R. E.

NANOSECOND PULSE LIGHT SOURCES USED IN FREE FLIGHT  
HYPERSONICS FOR BALLISTIC RANGE MEASUREMENTS,  
NOTING LESS PHOTOGRAPHIC BLURRING OF MOTION

A67-18881

## SLUSHER, R. E.

MULTIPHOTON PLASMA PRODUCTION AND STIMULATED  
RECOMBINATION RADIATION IN LEAD TELLURIDE,  
CONSIDERING ELECTRON-HOLE PAIR PRODUCTION RATE

A66-31884

OPTICAL NONLINEARITIES DUE TO CONDUCTION BAND  
ELECTRONS IN IN AS, IN SB, GA AS AND PB TE  
STUDIED, USING Q-SWITCHED CARBON DIOXIDE LASER  
RADIATION

A67-12524

INELASTIC SCATTERING OF CARBON DIOXIDE LASER  
RADIATION BY MOBILE LANDAU-LEVEL ELECTRONS IN N-  
IN SB

A67-17723

## SMIRNOV, V. S.

TRAVELING WAVES INTERACTION IN GAS LASER,  
EXPLAINING FORCING-OF-OSCILLATIONS AND TRAVELING  
WAVE SUPPRESSION EFFECT

A66-34685

TRAVELING WAVES INTERACTION IN GAS LASER,  
EXPLAINING FORCING-OF-OSCILLATIONS AND TRAVELING  
WAVE SUPPRESSION EFFECT

A67-14371

## SMIRNOVA, A. D.

SIGNAL EXCITATION IN NEGATIVELY CHARGED ANTENNA  
ROD IN EFFECT OF UNFOCUSED LASER BEAM

A66-42753

SIGNAL EXCITATION IN NEGATIVELY CHARGED ANTENNA  
ROD IN EFFECT OF UNFOCUSED LASER BEAM

A67-10835

HALATION OF PHOTOIONIZATION OF LIGHT SPARK  
INVESTIGATED, USING SUPER HIGH FREQUENCY RADIO  
RADIATION, FOR RUBY LASER

TT-66-61469 N66-34061

## SMITH, A. L. S.

OSCILLATION AMPLITUDE MODULATION IN AMMONIA BEAM  
MASER OSCILLATOR WITH SINGLE CAVITY FOLLOWED BY  
TWO CAVITIES IN CASCADE

A67-16636

## SMITH, A. W.

CORRELATIONS AND INTENSITY FLUCTUATIONS IN LIGHT  
FROM INDIVIDUAL LASING AND NONLASING MODES OF CW  
GA AS LASER AND THRESHOLD NOISE CHANGE IN LASER  
EMISSION

A66-26210

INTENSITY NOISE IN MULTIMODE GA AS LASER EMISSION

A66-32689

## SMITH, C. V.

LASER ILLUMINATED ELECTRO-OPTICAL IMAGING NOTING  
ENERGY VARIATION PARAMETERS, EQUIPMENT USED AND  
RESULTS OBTAINED IN TV RECEPTION

A66-35531

## SMITH, D. C.

ELECTRICAL BREAKDOWN OF GASES BY OPTICAL FREQUENCY  
RADIATION, NOTING LASER BEAM ATTENUATION AND  
SUBSEQUENT ENERGY ABSORPTION BY PLASMA

A66-26190

OPTICAL FREQUENCY BREAKDOWN THRESHOLD OF INERT GAS  
MIXTURES, USING FOCUSED BEAM RADIATION FROM Q-  
SPOILED NEODYMIUM LASER

A66-34236

## SMITH, F. W.

TRAVELING WAVE MASER FOR RADIO ASTRONOMY  
INTERFEROMETER NOTING SUPERCONDUCTING MAGNET,  
DYNAMO AND CRYOSTAT

A67-20115

## SMITH, H. A.

PROPERTIES OF SELF-TRAPPED LIGHT FILAMENTS NOTING  
STIMULATED RAMAN EMISSION AND CREATION,  
CONTAINMENT AND TERMINATION MECHANISMS

A67-16648

NEW CLASS LIGHT FILAMENT IDENTIFIED IN RAMAN  
RADIATION OF INTENSE RUBY LASER BEAM  
NASA-TM-X-57831

N66-33863

## SMITH, M. D.

MASERS AS EXCITATION MEANS FOR SPECTROGRAPHIC  
EXAMINATION OF METAL MICROSTRUCTURE

AD-632240 N66-29847

## SMITH, M. R.

DOUBLE PROBE AND MICROWAVE RESONANCE MEASUREMENTS  
OF GAS ADDITIVES EFFECT ON RADIAL VARIATION OF  
ELECTRON TEMPERATURE AND DENSITY WITH PARTIAL  
PRESSURES IN CARBON DIOXIDE-NITROGEN-HELIUM GAS  
LASER

A67-17274

## SMITH, P. D.

INTERNAL SELF-DAMAGE IN 25 MW RUBY LASER  
OSCILLATOR ROD

A66-41160

## SMITH, P. W.

OUTPUT POWER OF 6328 ANGSTROM HE- NE GAS LASER AS  
FUNCTION OF LASER GAIN, CAVITY LOSS AND OUTPUT  
COUPLING

A66-25651

MAXIMUM OUTPUT POWER APPROXIMATED FOR 6328  
ANGSTROM HE- NE GAS LASER, NOTING OPTIMUM MIRROR  
TRANSMISSION AND LASER GEOMETRY

A66-26571

COLLISION BROADENED LINEWIDTH AND SATURATION  
PARAMETERS FOR 6328 ANGSTROM TRANSITION OF NE IN  
HE- NE LASER

A66-31084

SINGLE MODE 6328 ANGSTROM UNITS HE- NE LASER  
HAVING SINGLE FREQUENCY POWER OUTPUT OF 50 MWATT  
STABILIZED BY FEEDBACK SYSTEM WHOSE OUTPUT IS  
NEITHER AMPLITUDE NOR FREQUENCY MODULATED

A67-16685

## SMITH, R. C.

LOSS MEASUREMENT FOR RUBY LASER RESONANT CAVITY,  
COMPARING THRESHOLDS FOR R SUB 1 AND R SUB 2  
LINE OPERATION

A67-16655

## SMITH, R. G.

ULTRASHORT OPTICAL PULSES GENERATED BY MODE  
LOCKING CONTINUOUS NEODYMIUM DOPED YTTRIUM-  
ALUMINUM GARNET LASER

A66-29391

## SMITH, W. V.

BOOK ON LASERS COVERING OPTICAL CAVITIES, GAS  
LASERS, SOLID STATE LASERS, OPTICAL PUMPING,  
Q-SWITCHING, POPULATION INVERSION, ETC

A66-42319

LASERS APPLIED TO LOGIC, MEMORY, INPUT-OUTPUT AND  
DATA TRANSMISSION-LINKAGES PARTS OF COMPUTERS

A66-42804

## SNITZER, E.

GLASS LASERS, COMPARING GLASS WITH CRYSTALS AS  
HOSTS FOR LASER IONS, CONSIDERING NEODYMIUM LASER  
PROPERTIES

A66-42800

LASER EMISSION AT 1.06 MICRONS FROM YTTERBIUM-  
NEODYMIUM GLASS, NOTING LINEARITY OF ENERGY  
TRANSFER WITH YB CONCENTRATION

- A67-16664  
SATURATED ABSORPTION OF COLOR CENTERS IN GLASS  
SELF-Q-SWITCHED PULSES, AS IN GLASS CODOPED WITH  
URANYL OXIDE AND ND IONS A67-16678
- SNYDER, G. L.  
RUBY LASER ENERGY REFLECTED OFF EXPLORER XXII  
SATELLITE A66-27054
- PULSED RUBY LASER PHOTOELECTRIC RECEIVER  
EXPERIMENTS DETERMINING SATELLITE ORBITS,  
SUPPLEMENTING BAKER-NUNN CAMERA NETWORK A66-42547
- SOBELMAN, I.  
DOPPLER AND IMPACT BROADENING OF SPECTRAL LINES  
AND PRESSURE EFFECTS ON POWER OUTPUT OF GAS LASER A67-16643
- SOBOLEV, N. N.  
ELECTRON TEMPERATURE IN ELECTRIC DISCHARGE  
APPLIED TO ARGON ION LASER A67-10550
- ELECTRON TEMPERATURE IN ELECTRIC DISCHARGE APPLIED  
TO ARGON ION LASER A67-11058
- POPULATION INVERSION OF UPPER LASER LEVEL OF  
CARBON DIOXIDE MOLECULES, NOTING ELECTRON-MOLECULE  
COLLISION AND EFFECT OF NEON ADDITION A67-13297
- POPULATION INVERSION OF UPPER LASER LEVEL OF  
CARBON DIOXIDE MOLECULES, NOTING ELECTRON-MOLECULE  
COLLISION AND EFFECT OF NEON ADDITION A67-14722
- ARGON DISCHARGE CHARACTERISTICS USED IN CONTINUOUS  
ACTION ION LASER FOR ANALYSIS OF INVERSION  
PRODUCTION MECHANISM A67-16680
- DEVELOPMENT OF OPTICAL QUANTUM GENERATOR FROM  
HIGHLY IONIZED LOW TEMPERATURE TO CONVERT HEAT  
ENERGY INTO ELECTRIC AND COHERENT LIGHT  
RADIATION ENERGIES FOR USE IN LASER  
JPRS-39659 A67-18113
- SOFFER, B. M.  
HOLE BURNING IN BLEACHABLE ABSORBERS USED AS LASER  
Q-SPOILER A66-29387
- C W LASER ACTION IN HOLMIUM-DOPED ERBIUM TRIOXIDE  
WITH DOMINANT PUMPING BY ENERGY TRANSFER BETWEEN  
IONS A66-42555
- FEASIBILITY OF USING FLUORESCING DYES PUMPED WITH  
RUBY LASER FOR LOWER THRESHOLDS THAN RAMAN TYPE  
LASERS A66-38187  
AD-636953
- SOKOLOVA, L. V.  
ELECTRON TEMPERATURE AND CONCENTRATION IN DC  
PLASMA ARC DETERMINED FROM THOMSON SCATTERING OF  
LASER RADIATION A66-33840
- ELECTRON TEMPERATURE AND CONCENTRATION IN DC  
PLASMA ARC DETERMINED FROM THOMSON SCATTERING OF  
LASER RADIATION A67-13209
- SOKOVIKOV, V. V.  
POPULATION INVERSION OF UPPER LASER LEVEL OF  
CARBON DIOXIDE MOLECULES, NOTING ELECTRON-MOLECULE  
COLLISION AND EFFECT OF NEON ADDITION A67-13297
- POPULATION INVERSION OF UPPER LASER LEVEL OF  
CARBON DIOXIDE MOLECULES, NOTING ELECTRON-MOLECULE  
COLLISION AND EFFECT OF NEON ADDITION A67-14722
- SOLIMENE, N.  
PULSED GAS DISCHARGE LASERS NOTING REQUIRED  
ENERGY LEVEL FOR MAXIMUM EFFICIENCY, EXPERIMENTAL  
TECHNIQUES AND RESULTS A67-16650
- SOLID STATE AND GAS LASER DEVELOPMENT - MANGANESE  
AND RARE EARTH COLLISION LASERS, LASER PUMPING  
LASER, PHOTODISSOCIATION LASERS, AND THERMAL  
OPTICAL EFFECTS IN SOLID STATE LASER MEDIA
- TRG-034-TR-1 N66-28553
- SOLOMATIN, V. S.  
MAGNETO-OPTICAL MODULATION OF IR EMISSION OF  
HE- NE GAS LASER A67-15139
- INTERNAL MODULATION OF IR GAS LASER USING  
CADMIUM SULFIDE OR SELENIDE SINGLE CRYSTALS A67-16914
- SOLOMKO, A. A.  
S HF MODULATION TECHNIQUES FOR LASER RADIATION,  
COVERING FARADAY, KERR AND POKEL EFFECTS,  
CIRCULAR DICHROISM, ETC A67-13138
- SONA, A.  
ACCURACY AND LIMIT ANALYSIS OF STATISTICAL  
DISTRIBUTION OF EM RADIATION FIELD BY  
PHOTOELECTRON COUNTING DISTRIBUTIONS FROM  
PHOTODETECTOR FOR SINGLE MODE LASER NEAR THRESHOLD A67-16624
- SONIN, A. S.  
NONLINEAR OPTICAL MATERIALS PROPERTIES DISCUSSED  
ON BASIS OF SOVIET AND FOREIGN STUDIES INVOLVING  
LASERS A67-11011
- SOPER, W. L.  
MERCURY WETTED RELAY PULSE GENERATOR AND PULSE  
TRANSFORMER TO DRIVE GALLIUM ARSENIDE LASERS IN  
FAST PULSE MODE N66-34246  
HDL-TM-66-3
- GALLIUM ARSENIDE LASER RADAR AND RANGEFINDING AT  
ROOM TEMPERATURE N67-16144  
HDL-TM-66-13
- SOREF, R. A.  
MODULATION BY ULTRASONIC DIFFRACTION OF 10.6  
MICRON LASER RADIATION IN PHOTOELASTIC CD S,  
GA AS AND SI CRYSTALS A66-39112
- COHERENT HOMODYNE DETECTION AT 10.6 MICROMETERS  
WITH ALUMINUM-DOPED SILICON PHOTOCONDUCTOR,  
PRESENTING NOISE SPECTRA AND VOLTAGE A67-13989
- SOROKIN, P. P.  
BOOK ON LASERS COVERING OPTICAL CAVITIES, GAS  
LASERS, SOLID STATE LASERS, OPTICAL PUMPING,  
Q-SWITCHING, POPULATION INVERSION, ETC A66-42319
- SOROKIN, V. N.  
GAS LASER OUTPUT AND THRESHOLD IN POPULATION  
INVERSION FROM PHOTODISSOCIATION OF METHYL IODIDE  
AND FLUOROiodo METHYLIDYNE A66-35368
- SORRELL, J.  
VIBRATIONAL-ROTATIONAL LINE STRENGTHS AND WIDTHS  
IN CARBON DIOXIDE, USING CARBON DIOXIDE-NEON LASER A66-27030
- SOSKIN, M. S.  
TIME CHARACTERISTICS IN GENERATION OF GIANT LASER  
PULSE STUDIED BY CIRCUIT WITH PRISMATIC SHUTTERS A66-29702
- LINEAR PHASE DISTORTIONS OF PLANE RESONATOR WITH  
TILTED MIRRORS AND EFFECTS ON GENERATION OF  
STIMULATED EMISSION IN RUBY CRYSTAL LASER A67-13130
- TUNABLE DISPERSION RESONATOR AND BROADENING OF  
LASER EMISSION SPECTRAL RANGE TO OBTAIN OPERATING  
FREQUENCY OTHER THAN FUNDAMENTAL A67-13131
- SOSNOWSKI, T. P.  
OPTICAL HETERODYNE SYSTEM USED TO MEASURE ELECTRON  
DENSITY OF PLASMA N67-11738  
NASA-CR-79511
- SOSZKA, W.  
LASER TECHNIQUE ACQUISITION OF DATA ON EXPLODING-  
WIRE PHENOMENA IN EXPLOSION MODEL, SUPERSONIC  
MODEL AND ABLATION MODEL A66-41701

- SOTSKII, B. A.  
PROPERTIES OF FINITE CYLINDRICAL DIELECTRIC  
RESONATOR - LASER OPTICS  
TG-230-T465 N66-34543
- BEHAVIOR OF CIRCULAR DIELECTRIC RESONATOR UNDER  
SOME CRITICAL OPERATING CONDITIONS  
TG-230-T475 N66-34783
- PARTIALLY COHERENT LIGHT DIFFRACTION CALCULATIONS  
APPLIED TO RUBY LASER RADIATION  
TG-230-T478 N66-37071
- SOURBE, M.  
EMISSION FROM TELLURIUM SINGLE CRYSTAL PUMPED BY  
TWO WAVES FROM CARBON DIOXIDE LASER  
A67-14914
- SPAETH, M. L.  
STIMULATED EMISSION OF POLYMETHINE DYES UPON  
PUMPING WITH Q-SWITCHED LASER, NOTING WAVELENGTH  
PARAMETERS AND OSCILLATION  
A66-42247
- SPECHT, W. A., JR.  
OUTPUT SPECTRA OF ND DOPED YAG AND RUBY LASERS,  
DETERMINING MECHANISMS RESPONSIBLE FOR OBSERVED  
OVERALL LINEWIDTHS  
A67-16660
- SPENCER, E. G.  
I R AND VISIBLE HELIUM-NEON LASER MODULATION USING  
FARADAY ROTATION IN YIG  
A66-26881
- SPILLER, E.  
STATISTICAL ANALYSIS OF LIGHT FIELDS CREATED BY  
SUPERPOSITION OF LASER LIGHT AND CHAOTIC LIGHT  
A66-29815
- SPINAK, S.  
OPTICAL SURFACE ROUGHNESS MEASUREMENT USING  
COHERENT RADIATION PRODUCED BY HELIUM-NEON LASER  
SIGMA-POLARIZED AT 6328 ANGSTROMS  
A67-10020
- SPONG, F. W.  
DEGRADATION OF CONTINUOUS ARGON LASER PERFORMANCE  
WHEN POSITIONED IN AXIAL MAGNETIC FIELD, NOTING  
ROLE OF QUENCHING, RADIATION TRAPPING AND  
EXCITATION MECHANISMS  
A66-37779
- ELECTRO-OPTIC INTRA-CAVITY COLOR SWITCHING IN  
KRYPTON ION FABRY- PEROT LASER  
A67-17888
- STAEBLER, D. L.  
LARGE WAVELENGTH CHANGES IN GALLIUM ARSENIDE  
INJECTION LASERS DUE TO CHANGES IN CAVITY Q  
A66-32635
- STARUNOV, M. G.  
RUBY LASER EXPERIMENT YIELDING GIANT PULSES BY  
SEPARATING MIRRORS FROM CRYSTALS  
A66-25684
- STATZ, H.  
TRANSITION PROBABILITIES AND LIFETIMES IN IONIZED  
ARGON GAS LASERS  
A66-26207
- RADIATIVE TRANSITION PROBABILITIES BETWEEN LASER  
VIBRATIONAL LEVELS OF CARBON DIOXIDE, NOTING  
RELAXATION TIME AND DIPOLE MOMENT  
A67-11891
- STEARNS, J. W.  
COMPACT DISCHARGE LAMP DESIGNED FOR CONTINUOUS  
PUMPING OF SOLID STATE LASER, WITH INTEGRAL MOUNTS  
FOR CRYSTALS AND ENCLOSURE PROVIDING COOLING  
CIRCUITS FOR LAMP AND CRYSTAL  
A66-41247
- STEEL, G. B.  
HIGH SPEED STROBOSCOPIC PHOTOGRAPHY USING KERR  
CELL MODULATED LASER SOURCE  
A66-30828
- LASER LIGHT SOURCE CONTROLLED BY KERR CELL  
COUPLED WITH Z-TYPE SCHLIEREN OPTICAL SYSTEM TO  
PRODUCE MULTIPLE FLASH PHOTOGRAPHS OF DETONATION  
WAVE DEVELOPMENT  
A67-12227
- STEEL, W. H.  
TWO-BEAM INTERFEROMETRY IN COHERENCE THEORY
- STEEL, A.  
PHASE-LOCKING SCHEME FOR FREQUENCY-STABILIZED  
GAS LASER OSCILLATORS  
NASA-CR-80958 N67-14893
- STEFFEN, H.  
LASER EMISSION INTERFEROGRAMS OBTAINED WITH  
FABRY- PEROT CROSS-GRATING INTERFEROMETER IN  
SUBMILLIMETER WAVELENGTH RANGE  
A66-37546
- SUBMILLIMETER LASER EMISSION FROM ICN NOTING  
INTERFEROGRAMS  
A66-37547
- STEFFEN, J.  
LASER EMISSION INTERFEROGRAMS OBTAINED WITH  
FABRY- PEROT CROSS-GRATING INTERFEROMETER IN  
SUBMILLIMETER WAVELENGTH RANGE  
A66-37546
- SUBMILLIMETER LASER EMISSION FROM ICN NOTING  
INTERFEROGRAMS  
A66-37547
- STEGELMANN, E. J.  
PROGRAM PLANNING, GROUND SUPPORT AND AIRBORNE  
EQUIPMENT FOR LASER SPACE COMMUNICATION SYSTEM  
NASA-CR-78855 N66-39446
- STEIER, W. H.  
PHASE LOCKING OF ONE LASER TO ANOTHER BY DIRECT  
INJECTION OF FIRST LASER BEAM INTO SECOND LASER  
CAVITY  
A66-26593
- COUPLING OF PULSE POWERS IN TEM OF UP TO 80 MW  
FROM HE- NE LASER AT 6328 ANGSTROMS  
A67-13678
- STEIN, A.  
THERMALLY-INDUCED OPTICAL PATH DISTORTIONS IN  
LASER RODS MEASURED BY OBTAINING TIME RESOLVED  
INTERFEROGRAMS, USING MACH- ZEHNDER  
INTERFEROMETER AND Q-SWITCHED LASER  
A66-25994
- DYNAMIC OPTICAL PATH DISTORTION IN RUBY AND  
NEODYMIUM DOPED GLASS LASER RODS DUE TO  
EVOLUTION OF THERMAL GRADIENTS DURING OPTICAL  
PUMPING CYCLE  
N66-28554
- STEIN, R.  
C W HE- NE LASER MEASUREMENT OF LIGHT SCATTERING  
IN CRYSTALS NOTING LASER OUTPUT, PERFORMANCE AND  
CRYSTAL IMPERFECTIONS  
A66-35402
- STEINHACKER, M.  
AIRBORNE LASER DRIVEN WEAPON SIMULATOR  
NAVTRADEVEN-1867-1 N66-35051
- STEPANOV, B. I.  
INTERCHANNEL GENERATION TRANSFER AND MULTICHANNEL  
GENERATION IN LASER WITH FOUR UNSPLIT LEVELS,  
NOTING RADIATION DENSITY, TEMPERATURE EFFECT AND  
VARIATIONS IN COEFFICIENTS OF LOSSES  
A66-38956
- RADIATION NOISE EFFECT ON LASER OPTICAL  
PROPERTIES, NOTING DENSITY VS RESONATOR  
CHARACTERISTICS, ENERGY SPECTRUM, ETC  
A66-40917
- INTERCHANNEL GENERATION TRANSFER AND MULTICHANNEL  
GENERATION IN LASER WITH FOUR UNSPLIT LEVELS,  
NOTING RADIATION DENSITY, TEMPERATURE EFFECT AND  
VARIATIONS IN COEFFICIENTS OF LOSSES  
A67-15760
- MATHEMATICAL FORMULAS TO DETERMINE RADIATION  
LOSS MEASUREMENT IN RUBY LASER  
TG-230-T468 N66-34235
- SPLITTING OF METASTABLE LEVEL OF THREE-LEVEL RUBY  
LASER  
TG-230-T467 N66-34267
- GEOMETRICAL OPTICS APPROXIMATION SOLUTION TO  
RADIATION POWER OF GAS LASER AS FUNCTION OF  
MIRROR MISALIGNMENT ANGLE  
TG-230-T474 N66-34884

- STEPANOV, B. M.  
CURRENT INJECTION EFFECT ON TIME DELAY OF GA AS  
LASER RADIATION A67-10083
- STEPANOV, D. P.  
HELIUM-NEON LASER MULTIBEAM GENERATION IN GAS  
DISCHARGE TUBE, USING SPHERICAL MIRRORS AND  
TAPERED PLATES A66-26053
- STEPANOV, V. K.  
FAST OVERLAP OF MICROWAVE RADIATION BY IONIZATION  
AUREOLE OF SPARK IN LASER BEAM A66-36719
- SIGNAL EXCITATION IN NEGATIVELY CHARGED ANTENNA  
ROD IN EFFECT OF UNFOCUSED LASER BEAM A66-42753
- SIGNAL EXCITATION IN NEGATIVELY CHARGED ANTENNA  
ROD IN EFFECT OF UNFOCUSED LASER BEAM A67-10835
- STEPINSKI, S.  
SPATIAL COHERENCE MEASUREMENT OF HE- NE LASER  
OUTPUT A66-35592
- STERN, F.  
STEADY STATE VARIATION OF LIGHT INTENSITY WITH  
DISTANCE FOR MONOCHROMATIC LIGHT, NOTING  
DEPENDENCE OF ABSORPTION COEFFICIENT ON DEGREE OF  
EXCITATION OF ELECTRONIC SYSTEM A66-26183
- SEMICONDUCTOR INJECTION LASERS  
REPT.-8 N66-27687
- STERN, W. A.  
LIGHT SHIFT, LIGHT MODULATION AND PHASE PULLING IN  
OPTICALLY PUMPED RUBIDIUM MASER A66-26202
- STETSENKO, B. V.  
CONTINUOUS HELIUM-NEON LASER USED TO OBTAIN  
SHORT INTENSE LIGHT PULSES AND TO STUDY KINETICS  
OF AUTOPHOTOELECTRONIC EMISSION OF HIGH  
RESISTIVITY SILICON A67-13142
- STETSER, D. A.  
REVERSIBLE BLEACHABLE DYE-SOLUTIONS FOR EXPANDER  
ELEMENTS IN LASER A66-29388
- OPTICAL SPECTRA OF ULTRASHORT OPTICAL PULSES  
GENERATED BY MODE-LOCKED GLASS-DOPED NEODYMIUM  
LASERS, CONSIDERING SATURABLE ABSORBER CELL PLACED  
PARALLEL TO FABRY- PEROT REFLECTOR A66-39115
- STICKLEY, C. M.  
LASER BRIGHTNESS GAIN AND SINGLE TRANSVERSE MODE  
OPERATION BY COMPENSATION FOR THERMAL DISTORTION  
WITH EXTERNAL MIRROR A67-16656
- EXTERNAL MIRROR FOR LASER BRIGHTNESS GAIN AND  
THERMAL COMPENSATING MODE CONTROL N67-16954
- STILLMAN, G.  
SYNTHESIS, JUNCTION FABRICATION, AND LUMINESCENT  
OPERATION OF GALLIUM-ARSENIDE-PHOSPHIDE  
SEMICONDUCTORS N66-36868
- AFCL-66-245
- JUNCTION EFFECTS IN COMPOUND SEMICONDUCTORS  
AFCL-66-617 N67-15074
- STILLMAN, G. E.  
CRYSTAL GROWTH, DIFFUSION AND FABRICATION OF  
GALLIUM ARSENIDE-PHOSPHIDE JUNCTION LASERS WITH  
LOW THRESHOLD CURRENT DENSITIES A66-37401
- OPTICAL PUMPING WITH DIODE LASER INTO FABRY-  
PEROT RESONATOR FACE OF THIN HIGHLY-ABSORBING  
SEMICONDUCTOR, NOTING VARIABLE MODE SPACING  
INCLUDING SINGLE MODE OUTPUT A67-10879
- STOCKER, T. L.  
SEGMENTED-ROD RUBY LASER STRUCTURE OPERATED AS  
GIANT PULSE LASER, USING KERR CELL TO PROVIDE  
Q-SWITCHING, NOTING NUMBER OF OSCILLATING MODES
- MIRROR DAMAGE ALLEVIATION IN GIANT PULSE  
SEMICONDUCTOR LASER OPERATION, DISCUSSING USE OF  
HIGH MELTING POINT MIRRORS COOLING AND OBLIQUE  
INCIDENCE A66-38245
- Q-SWITCHED LASER OPERATION OBSERVED USING LIQUID  
SELENIUM MIRROR AS REFLECTOR IN RUBY LASER  
MEASURING REFLECTIVITY CHANGES A67-16679
- STOICHEFF, B. P.  
ABSORPTION SPECTRA IN OPTICAL REGION WHEN LASER  
RADIATION AND CONTINUOUS RADIATION ARE  
SIMULTANEOUSLY INCIDENT ON MOLECULAR MEDIUM A66-26161
- STOILOV, IU. IU.  
TIME PARAMETERS OF POWERFUL LASER MEASURED WITH  
GA AS PHOTODIODE, NOTING TIME CONSTANT AND TIME  
RESOLUTION OF PHOTODIODE A66-27750
- STOLIAROV, S. N.  
EFFECT OF DIFFUSION OF EXCITATION ON CONDITIONS OF  
MULTIMODE GENERATION IN LASER RADIATION A67-13207
- STONE, E.  
THERMAL HIGH RESOLUTION RECORDING USING MOVING  
LASER SPOT ON METALLIC AND ORGANIC THIN FILMS A67-16586
- STORY, J. B.  
HOLOGRAM MEASUREMENTS OF OPTICALLY INHOMOGENEOUS  
FIELD BY PULSED LASER NASA-CR-82463 N67-19271
- STOVER, H. L.  
PHASE LOCKING OF ONE LASER TO ANOTHER BY DIRECT  
INJECTION OF FIRST LASER BEAM INTO SECOND LASER  
CAVITY A66-26593
- STRAKHOV, V. P.  
THRESHOLD AND POWER CHARACTERISTICS OF GALLIUM  
ARSENIDE DIODE LASER OPERATING IN PULSED REGIME A67-10066
- TEMPERATURE DEPENDENCE OF THRESHOLD CURRENT IN  
INJECTION LASERS IN CONTINUOUS OPERATION UNDER  
LIQUID NITROGEN COOLING A67-18788
- STRAKHOVSKII, G. M.  
HYDROGEN ATOM BEAM CHARACTERISTICS, DISCUSSING  
SIGNAL POWER, GENERATING FREQUENCY, RADIATION  
SIGNAL DAMPING AND HYDROGEN ATOM RELAXATION TIME A66-28289
- GALLIUM ARSENIDE LASERS OPERATING AT ROOM  
TEMPERATURE INVESTIGATED, BASED ON DIFFUSION P-N  
JUNCTIONS, DISCUSSING EMISSION SPECTRUM A66-36070
- TWO-LASER CAVITY IN TANDEM TO RESOLVE COMPONENTS  
WITH HOMOGENEOUSLY BROADENED / DOPPLER/ LINE A66-36720
- PULSED INDUCED EMISSION IN HYDROGEN BEAM LASER FOR  
CASE OF TWO RELAXATION TIMES, DETERMINING  
POLARIZATION ONLY BY NUMBER OF ACTIVE PARTICLES IN  
RESONATOR A66-41091
- VOLT-AMPERE CHARACTERISTICS AND OTHER PROPERTIES  
OF GA AS LASERS WITH TELLURIUM AND ZN-DOPED  
EPITAXIAL P-N JUNCTION A67-10080
- MASER OSCILLATION INTENSITY AND FREQUENCY  
DEPENDENCE ON CONSTANT ELECTRIC AND MAGNETIC  
FIELDS ACTING ON MOLECULAR BEAM IN FRONT OF  
RESONATOR A67-10396
- CONTINUOUS COHERENT RADIATION OF GA AS  
SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT  
AMBIENT TEMPERATURE OF 77 DEGREES K A67-10548
- CONTINUOUS COHERENT RADIATION OF GA AS  
SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT  
AMBIENT TEMPERATURE OF 77 DEGREES K A67-11056

- AMPLITUDE AND FREQUENCY CHARACTERISTICS OF  
HYDROGEN-ATOM BEAM MASER A67-11574
- STRAUSS, A. J.**  
SPONTANEOUS AND COHERENT PHOTOLUMINESCENCE IN  
CADMIUM MERCURY TELLURIDE CRYSTALS EXCITED  
OPTICALLY BY GA AS DIODE LASER A66-29390
- COHERENT AND SPONTANEOUS EMISSION FROM LEAD-TIN  
TELLURIDE ALLOYS UPON EXCITATION BY GA AS DIODE  
LASER, NOTING BAND STRUCTURE OF ALLOY SYSTEM A66-34159
- STRELNIKOVA, I. A.**  
MINIMUM SPECTRAL LINE WIDTH, THRESHOLD CURRENT  
DENSITY, RADIATION-PEAK DISPLACEMENT AND POSSIBLE  
RECOMBINATION MECHANISM FOR GA SB LASER DIODE P-N  
JUNCTIONS IN COHERENT RADIATION A66-31764
- MINIMUM SPECTRAL LINE WIDTH, THRESHOLD CURRENT  
DENSITY, RADIATION-PEAK DISPLACEMENT AND POSSIBLE  
RECOMBINATION MECHANISM FOR GA SB LASER DIODE P-N  
JUNCTIONS IN COHERENT RADIATION A67-10085
- STRIZHEVSKII, V. L.**  
SPECTRAL COMPOSITION OF LASER LIGHT WITHIN  
FRAMEWORK OF THEORY OF NONLINEAR OPTICAL EFFECTS A66-29356
- SPECTRAL COMPOSITION OF LASER LIGHT WITHIN  
FRAMEWORK OF THEORY OF NONLINEAR OPTICAL EFFECTS A66-37360
- STROMBEHN, J. W.**  
LASER APPLICABILITY TO LINE-OF-SIGHT ATMOSPHERIC  
TURBULENCE PARAMETERS A67-17383
- STROME, F. C.**  
DEPENDENCE OF MAGNITUDE OF HERSCHEL BLEACHING IN  
PHOTOGRAPHIC EMULSION ON DELAY BETWEEN FORWARD AND  
BLEACHING EXPOSURE, USING LASER RADIATION A66-28884
- STROME, F. C., JR.**  
NATURE OF EXCITED STATE RESULTING FROM TWO-QUANTUM  
ABSORPTION ASSOCIATED WITH FLUORESCENCE IN  
ANTHRACENE PRODUCED BY RUBY LASER A67-16130
- STUDENOV, V. B.**  
SIGNAL EXCITATION IN NEGATIVELY CHARGED ANTENNA  
ROD IN EFFECT OF UNFOCUSED LASER BEAM A66-42753
- SIGNAL EXCITATION IN NEGATIVELY CHARGED ANTENNA  
ROD IN EFFECT OF UNFOCUSED LASER BEAM A67-10835
- STUREL, B.**  
INTENSE PULSE GENERATION AT 5300 ANGSTROMS BY  
FREQUENCY DOUBLING IN Q-SWITCHED AND GLASS LASER  
AND POSSIBILITY OF GENERATING PARTICULAR HARMONICS A67-10759
- SUBBES, E. V.**  
CHARACTERISTICS OF PULSED LASER ACTION IN HE- NE  
AND HE- AR MIXTURES AT PRESSURES ABOVE 200 MM HG A67-14189
- SUCHKOV, A. F.**  
GIANT COHERENT LIGHT PULSE GENERATION BY Q-  
FACTOR-MODULATED LASER A66-31183
- DERIVATION OF TWO EQUATIONS FOR ELECTROMAGNETIC  
FIELD AND POPULATION INVERSION IN SOLID STATE  
LASER A66-35370
- GIANT COHERENT LIGHT PULSE GENERATION BY Q-FACTOR  
MODULATED LASER A67-12941
- SUCOV, E. W.**  
HIGH TEMPERATURE PLASMAS PRODUCED BY Q-SWITCHED  
LASER BEAM FOCUSED ON ALUMINUM TARGETS  
T10-22928 N67-13974
- SUDA, N.**  
RADIATION INTERACTION BETWEEN LASER OSCILLATORS  
WITH DIFFERENT ACTIVE MATERIALS AND FREQUENCIES A66-42549
- SUDZILOVSKII, V. IU.**  
LOCAL LASER HEATING OF CATHODE FOR ELECTRON  
EXTRACTION FROM PLASMOID A66-29879
- PERFORMANCE OF GA AS SEMICONDUCTOR LASER WITH  
RESONATOR, NOTING DEPENDENCE OF FORBIDDEN ZONE  
WIDTH AND ABSORPTION COEFFICIENT ON FREE CARRIER  
CONCENTRATION AND INCIDENT PHOTON ENERGY A66-38955
- PERFORMANCE OF GA AS SEMICONDUCTOR LASER WITH  
RESONATOR, NOTING DEPENDENCE OF FORBIDDEN ZONE  
WIDTH AND ABSORPTION COEFFICIENT ON FREE CARRIER  
CONCENTRATION AND INCIDENT PHOTON ENERGY A67-15759
- SEMICONDUCTOR GALLIUM-ARSENIDE LASER WITH FLAT  
RESONATOR N66-36291
- SUEMATSU, Y.**  
RESONANCE-LIKE CHARACTERISTICS OF DIRECT  
MODULATION OF JUNCTION LASER WITH BIAS CURRENT  
ANALYZED BY RATE EQUATIONS A67-19800
- SUGANO, S.**  
THEORETICAL EXCITED STATE ABSORPTION SPECTRUM OF  
ELECTRON TRANSITIONS IN OPTICALLY PUMPED RUBY  
LASER A66-39570
- SUKHANOVSKII, A. N.**  
MEASUREMENT OF DISTANCE TO MOON BY OPTICAL  
RADAR, DISCUSSING RUBY LASER/PHOTOMULTIPLIER  
APPARATUS AND PROCEDURE A66-30291
- LUNAR FIGURE AND ORBIT PARAMETERS MEASURED BY  
OPTICAL LOCATION METHOD A66-35285
- SUKHANOVSKIY, A. N.**  
DESCRIPTION OF RUBY LASER USED IN OPTICAL LOCATION  
OF MOON  
NASA-TT-F-8866 N66-29428
- SUKHEEJA, B. D.**  
TRANSIENTS AND STABILITY OF IDEALIZED TWO-LEVEL  
LASER SYSTEM, OBTAINING RATE EQUATION SOLUTION,  
NOTING CHARACTERIZATION BY RELAXATION TIMES A66-41034
- SUKHODREV, N. K.**  
GIANT-PULSE LASER-INDUCED ATMOSPHERIC ELECTRIC  
BREAKDOWN CAUSING OPTICAL FREQUENCY DISCHARGE A66-26194
- SUKHORUKOV, A. P.**  
CONSISTENT THEORY OF NONLINEAR OPTICAL EFFECTS IN  
BOUNDED LIGHT BEAMS BY EXTENDING PARABOLIC  
EQUATIONS TO NONLINEAR PROBLEMS A66-41095
- SULLIVAN, G. F.**  
TEMPERATURE DEPENDENCE OF THRESHOLD FOR STIMULATED  
EMISSION OF NO TRIVALENT ION IN SEVERAL HOST  
LATTICES ESTIMATED FROM INTENSITY VARIATION OF  
LASER ACTIVE FLUORESCENCE COMPONENT A67-11085
- SULLIVAN, N. A.**  
GALLIUM ARSENIDE DIODE LASER AS PULSED IR SOURCE  
FOR EXPERIMENT AND DESIGN CONSIDERATIONS FOR RADAR  
INDICATION OF CLOUD HEIGHT AND VISIBILITY A66-33616
- SULWAY, D. V.**  
SCANNING ELECTRON MICROSCOPE TO EXAMINE CRYSTAL  
MOSAIC STRUCTURES AND LASING PROPERTIES OF GALLIUM  
ARSENIDE LASER DIODES A66-33300
- SUN, K. H.**  
Q-SWITCH PULSED RUBY LASER IRRADIATION-INDUCED  
CHEMICAL DISSOCIATION AND IONIZATION IN RESIDUAL  
GASES A66-42076
- SUNGUROVA, O. A.**  
CONTINUOUS COHERENT RADIATION OF GA AS



- SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT AMBIENT TEMPERATURE OF 77 DEGREES K A67-10548
- CONTINUOUS COHERENT RADIATION OF Ga AS SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT AMBIENT TEMPERATURE OF 77 DEGREES K A67-11056
- SUPRYNOWICZ, V. A.  
FORMATION OF ULTRASONICALLY GATED GIANT LASER PULSES BY Q-SPOILING, NOTING PHOTOGRAPHS OF RUBY AND ROLE OF CAVITATION IN GATING MECHANISM A66-25057
- SUSAKI, W.  
SIMULTANEOUS DERIVATION OF OPTICAL GAIN FACTOR AND LOSS PER UNIT LENGTH OF SERIES OF SOLUTION GROWN DIFFUSED Ga AS INJECTION LASER A67-11072
- SUSHCHIK, M. M.  
SPONTANEOUS EMISSION SPECTRA AND RATIO OF NUMBER OF PHOTONS IN VARIOUS OSCILLATION MODES OF LASER WITH NONLINEAR FILTER TYPE LOCK A67-11573
- SUSHKOV, V. P.  
RELAXATION TIME FOR RECOMBINATION RADIATION FROM SEMICONDUCTOR SOURCE DETERMINED BY MEASURING CURRENT/EMISSION PHASE SHIFT A66-29704
- SUVOROV, V. S.  
NONLINEAR OPTICAL MATERIALS PROPERTIES DISCUSSED ON BASIS OF SOVIET AND FOREIGN STUDIES INVOLVING LASERS A67-11011
- SUZUKI, C.  
PULSED LASER OPERATION IN WEDGE-SHAPED RUBY ROD AT ROOM TEMPERATURE A66-29415
- SUZUKI, N.  
HELIUM-NEON LASER AFTERGLOW AND METASTABLE HELIUM ATOMS UNDER LONG PULSE EXCITATION A66-27335
- SUZUKI, T.  
OPTICAL RESONATOR DIFFRACTION LOSS, NOTING LASER OSCILLATIONS IN HIGH LOSS ARRANGEMENTS, OUTPUT BEAM POWER, FIELD PATTERNS, ETC A66-25195
- SPATIAL COHERENCE OF LASER LIGHT BEAM AFTER EXTREME WAVEFRONT DISTORTIONS ON DIFFUSION EXPLAINED ON BASIS OF FRAUNHOFER AND FRESNEL DIFFRACTION A67-11062
- FOURIER TRANSFORM HOLOGRAPHY FOR DIFFUSION OF COHERENT LASER LIGHT BEAM, EXAMINING DISTORTION TERM IN RECONSTRUCTED IMAGE A67-11063
- SVELTO, O.  
EXPERIMENTAL OBSERVATION OF REGULAR SPIKING IN NEODYMIUM DOPED GLASS LASER ROD ATTRIBUTED TO SIMULTANEOUS OSCILLATION OF MANY TRANSVERSE AND LONGITUDINAL MODES A66-28727
- SINGLE TRANSVERSE AND LONGITUDINAL MODES OBSERVED IN OUTPUT OF PASSIVE Q-SWITCHED RUBY LASER WHEN TWO SPHERICAL MIRRORS ARE USED FOR RESONATOR A66-42563
- SVIRIDENKOV, E. A.  
RUBY PHOTOCONDUCTIVITY WHEN EXPOSED TO LASER IRRADIATION, NOTING OSCILLOGRAMS A66-33941
- SVOREN, R.  
FUTURE PROSPECTS OF LASER AS LIGHT COMMUNICATIONS DEVICE AND RADIO RECEIVER JPRS-36111 N66-29552
- SWANSON, B. W.  
PULSED ARC XENON DISCHARGES USED FOR OPTICAL PUMPING OF HIGH ENERGY LASERS AD-632892 N66-31537
- SWIDERSKI, J.  
GALLIUM ARSENIDE LASER DESIGN USING P-N JUNCTION OBTAINED BY DIFFUSION OF ZINC IN TELLURIUM DOPED N-Ga AS SINGLE CRYSTAL A66-29057
- SWINDALL, P. M.  
COMMUNICATION SYSTEM RESEARCH ON HYDROGEN MASER, SOLID STATE IMAGE CONVERTER, AND TELEMETRY SIGNAL PROPAGATION NASA-TM-X-53535 N67-16724
- SWINSON, W. F.  
LASER FOR PHOTOELASTICITY INCLUDING SCATTERED-LIGHT METHOD, CONVENTIONAL TRANSMISSION POLARISCOPE WITH STATIC LOADS AND DYNAMIC PHOTOELASTICITY A66-32072
- SWOPE, C. H.  
RETINAL LESIONS PRODUCED BY RUBY LASER IN RABBITS AND HUMANS A66-82224
- SYCHEV, V. V.  
SUPERCONDUCTOR SOLENOID APPLICATION TO LASER DEVICES AND DEVELOPMENT OF MAGNETIC PLASMA TRAPS FOR RESEARCH IN CONTROLLED THERMONUCLEAR REACTIONS A66-41743
- SYDNOR, R. L.  
FREQUENCY STABILITY DETERMINATION FOR HYDROGEN MASERS N66-38554
- SYSIK, R. J.  
GRANULARITY CHARACTERISTICS OF SCATTERED LIGHT FROM HELIUM-NEON LASER DIRECTED ONTO MOVING SURFACE A66-31725
- SZABO, A.  
EXTENSION OF PAPER ON SATURABLE ABSORBER GIANT PULSE LASERS TO INCLUDE EFFECTS OF FINITE ABSORBER LIFETIME ON PULSE PARAMETERS, NOTING PUMP ROLE A67-18148
- SZERSZEN, J.  
PULSE GENERATOR FOR DRIVING SEMICONDUCTOR LASER DIODE, NOTING CIRCUIT DIAGRAM AND OPERATING CHARACTERISTICS A66-37588
- SZOEKE, A.  
HELIUM-NEON GAS LASER USED TO STUDY PRESSURE EFFECT ON LINE SHAPE OF 2S-2P OPTICAL TRANSITIONS OF NEON EXCITED STATES A66-26198
- OUTPUT POWER FREQUENCY RESPONSE OF SINGLE MODE HELIUM NEON LASER, DETERMINING EFFECTS OF ATOMIC COLLISIONS ON FREQUENCY RESPONSE OF INDIVIDUAL ATOMS A66-29812
- T
- TAKAHASHI, S.  
TRAVELING WAVE MASER AS PREAMPLIFIER IN GROUND STATION FOR SATELLITE COMMUNICATION A66-40658
- TAKATSUJI, M.  
FAR IR RADIATION DETECTED AT VISIBLE FREQUENCY, USING NONLINEAR OPTICAL MIXING WITH LASERS A66-33322
- TAKUMA, H.  
INTERACTION BETWEEN STIMULATED BRILLOUIN AND RAMAN SCATTERING IN CARBON SULFIDE, USING OPTICAL RESONATOR AND LASER BEAM A66-26162
- TALBOT, G. A.  
HIGH CURRENT SOLID STATE PULSER USED TO DRIVE INJECTION LASER FOR ROOM TEMPERATURE OPERATION ECOM-2753 N67-15343
- TAN, A.-T.  
ABSORBER CONCENTRATION EFFECT ON PULSED LASER SYSTEM NOTING PERFORMANCE CHARACTERISTICS, THRESHOLD ENERGY, PUMPING DYNAMICS AND TIME PARAMETERS A66-42254
- TAN, T. Y.  
WAVE INTERACTION IN SATURABLE ABSORBERS, NOTING HOLE BURNING IN DYE SWITCHED RUBY LASER A67-20094

- TANAKA, K.**  
CONSTRUCTION METHODS OF DC OPERATED HE/ NE LASER  
TUBES USING OPTICAL CONTACT BONDS A67-14763
- TANAKA, T.**  
PULSED LASER OPERATION IN WEDGE-SHAPED RUBY ROD  
AT ROOM TEMPERATURE A66-29415
- TANG, C.**  
SPECTRAL AND MODE PROPERTIES OF RUBY, SOLID STATE,  
FABRY-PEROT, AND NEODYMIUM-DOPED YAG LASERS  
S-852 N66-30264
- TANG, C. L.**  
TRANSITION PROBABILITIES AND LIFETIMES IN IONIZED  
ARGON GAS LASERS A66-26207
- UPPER LASER STATES DERIVING POPULATION THROUGH  
CASCADE TRANSITIONS FROM HIGHER LAYER STATES OF  
ARGON ION NOTING CONSISTENCY OF LASER OUTPUT  
CURRENT DEPENDENCE WITH CURRENT DEPENDENCE OF  
CASCADE RATE A66-37774
- RADIATIVE TRANSITION PROBABILITIES BETWEEN LASER  
VIBRATIONAL LEVELS OF CARBON DIOXIDE, NOTING  
RELAXATION TIME AND DIPOLE MOMENT A67-11891
- RELATIVE INTENSITIES AND CASCADE TRANSITION RATIO  
IN CW AR II LASER NEAR 4103.9 ANGSTROMS A67-19560
- TANNENWALD, P. E.**  
STIMULATED BRILLOUIN SCATTERING IN QUARTZ  
ANALYZED, NOTING AMPLIFICATION, STOKES WAVE  
GENERATION AND RUBY GAIN A66-26165
- TANNER, L. H.**  
COHERENT GAS LASER LIGHT TO MEET REQUIREMENTS OF  
STREAK PHOTOGRAPHY FOR TIME-RESOLVED FLOW  
VISUALIZATION A66-32959
- INTERFEROMETER DESIGN FOR USE WITH LASER LIGHT IN  
FLUID MECHANICS A67-15455
- TARASOV, I. A.**  
STEADY STATE REGIME OF ELECTROMAGNETIC OSCILLATION  
IN LASER A66-27065
- EMISSION SPECTRUM OF RUBY MASER CALCULATED, USING  
DYNAMICS OF TWO-LEVEL SYSTEMS A66-29988
- STEADY STATE REGIME OF ELECTROMAGNETIC OSCILLATION  
IN LASER A66-40824
- TARASOV, V. K.**  
RUBY AND NEODYMIUM GLASS LASERS SUM FREQUENCY  
GENERATION USING NONLINEAR ELECTRO-OPTICAL KDP  
CRYSTAL A67-17754
- TARAVELLIER, R.**  
INTERFERENCES BETWEEN WAVES DIFFRACTED BY CIRCULAR  
SCREENS OR THIN WIRES AND COHERENT BACKGROUND  
PROVIDED BY LASER, PRODUCING RINGS OR RECTILINEAR  
FRINGES A67-10231
- INTERFERENCES BETWEEN COHERENT LIGHT BACKGROUND  
AND LIGHT DIFFRACTED BY SMALL APERTURE IN CASE OF  
STRONGLY ASTIGMATIC BEAM A67-14416
- TARG, R.**  
OPERATION AND IMPROVEMENT OF FREQUENCY MODULATED  
AND SUPER-MODE LASERS  
IER-3 N66-30672
- PROPERTIES OF FM AND SUPER-MODE HELIUM-NEON  
LASERS, AND ABSOLUTE FREQUENCY STABILIZATION OF  
FM LASER  
IER-4 N66-35096
- AUTOMATIC FREQUENCY CONTROL SYSTEM FOR ABSOLUTE  
FREQUENCY STABILIZATION  
IER-5 N67-15312
- TATARENKOV, V. M.**  
HYDROGEN ATOM BEAM CHARACTERISTICS, DISCUSSING  
SIGNAL POWER, GENERATING FREQUENCY, RADIATION  
SIGNAL DAMPING AND HYDROGEN ATOM RELAXATION TIME  
A66-28289
- GALLIUM ARSENIDE LASERS OPERATING AT ROOM  
TEMPERATURE INVESTIGATED, BASED ON DIFFUSION P-N  
JUNCTIONS, DISCUSSING EMISSION SPECTRUM A66-36070
- MASER OSCILLATION INTENSITY AND FREQUENCY  
DEPENDENCE ON CONSTANT ELECTRIC AND MAGNETIC  
FIELDS ACTING ON MOLECULAR BEAM IN FRONT OF  
RESONATOR A67-10396
- TATARINTSEV, L. V.**  
LEAD AZIDE AND PENTAERYTHRITETETRANITRATE  
EXPLOSION TRIGGERED BY LASER RADIATION A67-19315
- TAYLOR, C. E.**  
LASER FOR PHOTOELASTICITY INCLUDING SCATTERED-  
LIGHT METHOD, CONVENTIONAL TRANSMISSION  
POLARISCOPE WITH STATIC LOADS AND DYNAMIC  
PHOTOELASTICITY A66-32072
- DYNAMIC PHOTOELASTICITY MEASUREMENTS OF STRESS  
CONCENTRATION, USING RUBY LASER MONOCHROMATIC  
LIGHT SOURCE A66-34557
- TCHEN, C. M.**  
NONLINEAR INCOHERENT SCATTERING OF LASER BEAM FROM  
PLASMA  
R66SD40 N66-36016
- TEM BOSCH, J. J.**  
MICHELSON INTERFEROMETER USED TO STUDY MODES OF  
RED HE- NE LASER A66-33316
- TENGBLAD, R.**  
INVERTED SUSCEPTIBILITY, INVERSION RATIO, LINE  
WIDTHS AND SPIN-LATTICE RELAXATION TIMES FOR MASER  
OPERATION POINT IN CHROMIUM-DOPED COBALT POTASSIUM  
CYANATE A66-30934
- TER-MIKHAELIAN, M. L.**  
STEADY STATE LASER DESIGN, COMPARING BALANCE  
METHOD WITH METHOD BASED ON QUASI-CLASSICAL THEORY  
A67-20245
- TER-MIKHAELIAN, M. L.**  
SEMICLASSICAL AND RATE EQUATIONS COMPARED FOR  
DETERMINATION OF OUTPUT POWER OF STEADY STATE RUBY  
LASER A67-16628
- TEREKHIN, D. K.**  
LONGITUDINAL MAGNETIC FIELD EFFECT UPON GAS  
DISCHARGE, ZEEMAN EFFECT AND FARADAY EFFECT IN  
HE- NE GAS LASER A66-40586
- TERENTEV, V. E.**  
EXPERIMENTAL STUDY OF EMISSION CONTROL IN RUBY  
LASER USING DIFFRACTION MODULATOR WITH MODULATED  
TRAVELING ULTRASONIC WAVE A66-33516
- EXPERIMENTAL STUDY OF EMISSION CONTROL IN RUBY  
LASER USING DIFFRACTION MODULATOR WITH MODULATED  
TRAVELING ULTRASONIC WAVE A66-42129
- TERHUNE, R. W.**  
NONLINEAR OPTICS EMPHASIZING PARAMETRIC  
OSCILLATION, SELF-FOCUSING AND TRAPPING OF LASER  
BEAMS AND STIMULATED RAMAN, RAYLEIGH AND  
BRILLOUIN SCATTERING, USING MAXWELL EQUATIONS  
AND ELECTRIC DIPOLE APPROXIMATION A66-42810
- TERNEAUD, A.**  
INTENSITY DISTRIBUTION AT FOCUS OF HIGH POWER  
LASER, NOTING MEASURING METHOD A66-28834
- THOMAS, C. H.**  
Q-SWITCHED RUBY LASER CONFIGURATION WITH FEEDBACK  
CONTROL, NOTING FREQUENCY AND INSTABILITY  
CORRELATION WITH THEORETICAL RESULTS OBTAINED  
FROM MATHEMATICAL MODEL A67-16676

- THOMAS, E. L.  
MOLECULAR OSCILLATION DIFFERENCE FREQUENCY  
GENERATION IN IR SPECTRUM BY BEATING TOGETHER  
LASER AND LASER-STIMULATED RAMAN EMISSION  
A66-42544
- THOMAS, R. A.  
FREQUENCY TUNING OF COHERENT EMISSION OVER  
VIBRONIC CONTINUUM OF PHONON-TERMINATED OPTICAL  
MASERS BY THERMAL TUNING AND WAVELENGTH-SELECTIVE  
FEEDBACK  
A66-41369
- THOMAS, S. J.  
MOMENTUM TRANSFER CAUSED BY FOCUSING LASER GIANT  
PULSE ON SURFACE IN VACUUM INVESTIGATED FOR BE,  
C, AL, ZN, AG AND W  
A66-35418
- LASER GIANT PULSE DAMAGE TO DIELECTRIC MIRROR  
COATINGS IMMERSSED IN NITROBENZENE SOLUTION  
A66-36075
- Q-SWITCHING LASER SYSTEM TO OBTAIN SIMULTANEOUS  
GIANT PULSES FROM FIVE RUBY LASER OSCILLATORS  
A66-42302
- KINETIC ENERGIES OF IONS PRODUCED BY GIANT LASER  
PULSES, NOTING DEPENDENCE OF MEAN SQUARE ION  
VELOCITY ON PULSE PEAK INTENSITY  
A67-15099
- THOMPSON, B. J.  
READOUT TECHNIQUE FOR LASER FOG DISDROMETER  
A66-33346
- THOMPSON, H. B.  
SCATTERING OF ELECTRON BEAM BY STANDING WAVES OF  
PHOTONS INSIDE LASER CAVITY CORRESPONDS TO  
STIMULATED COMPTON EFFECT  
A66-26155
- THOMPSON, R. A.  
THERMOELASTIC WAVE EQUATIONS IN CONTINUUM  
MECHANICS MODEL OF LASER-INDUCED FRACTURE IN  
TRANSPARENT MEDIA IN TERMS OF LASER BEAM ENERGY  
ABSORPTION  
A66-40089
- THOMSON, A. F. H.  
RING LASER ROTATION SENSING SYSTEM, EVALUATING  
ACCURACY LIMIT FOR MINIMIZED INACCURACY OF  
KNOWN SOURCES OF ERROR  
A67-13992
- THORBURN, E. K.  
DIFFRACTION LIMITED PERFORMANCE ACHIEVED FOR  
FLYING SPOT RECORDING AND READOUT, USING  
CONCENTRIC OPTICAL SYSTEM, APPLIED TO LASER  
SCANNER  
A67-15322
- THORNTON, J. R.  
LASER DOPPLER VELOCIMETER FOR MEASURING LOCALIZED  
FLOW VELOCITIES IN LIQUIDS  
A66-27053
- LASER DOPPLER VELOCIMETER FOR GAS AND LIQUID FLOW  
VELOCITY MEASUREMENT  
A66-42557
- THORNTON, P. R.  
SCANNING ELECTRON MICROSCOPE TO EXAMINE CRYSTAL  
MOSAIC STRUCTURES AND LASING PROPERTIES OF GALLIUM  
ARSENIDE LASER DIODES  
A66-33300
- TIKHONOV, A. A.  
DYSPROSIUM DOPED CALCIUM FLUORIDE GIANT PULSE  
LASER WITH HIGH REPETITION RATE OBTAINED, USING  
DC PUMPING XENON LAMP  
A67-16674
- TILLOTSON, L. C.  
OPTICAL COMMUNICATION SYSTEMS, DISCUSSING  
AVAILABLE EQUIPMENT, TRANSMISSION CHARACTERISTIC,  
LACK OF LONG DISTANCE OPERATION RELIABILITY, ETC  
A66-42805
- TILLSON, D. M.  
INTERFEROMETRIC TYPE RANGING SYSTEM UTILIZING CW  
LASER  
NASA-TM-X-55608  
N67-11380
- TISCHER, F. J.  
GAS LENS FOCUSING OF LIGHT BEAMS, USING HIGHLY  
TRANSPARENT GAS WITH WEAKLY VARYING REFRACTIVE  
INDEX TO GUIDE COHERENT TRANSMISSION WITH SMALL  
LOSSES  
A67-19789
- TIUNOV, IU. A.  
UNCOUPLED INTENSITY PEAKS IN LASER EMISSION  
A67-13132
- TOBIAS, I.  
FREQUENCY STABILIZATION OF GAS LASER TO LOCK  
OUTPUT TO CENTER OF ATOMIC RESONANCE, USING ERROR  
SIGNAL  
A66-38241
- TOLCHINSKAIA, T. B.  
RADIATIVE POWER AMPLIFICATION OF HE- NE LASER  
WITH NEARLY CONFOCAL RESONATORS  
A66-41453
- RADIATIVE POWER AMPLIFICATION OF HE- NE LASER  
WITH NEARLY CONFOCAL RESONATORS  
A67-14190
- TOLMACHEV, A. M.  
CURRENT INJECTION EFFECT ON TIME DELAY OF GA AS  
LASER RADIATION  
A67-10083
- TOLSTOI, N. A.  
RELATION BETWEEN NONLINEAR LUMINESCENCE  
QUENCHING AND CONCENTRATION OF LUMINESCENCE  
CENTERS IN LASER CRYSTAL  
A66-29204
- RELATION BETWEEN NONLINEAR LUMINESCENCE QUENCHING  
AND CONCENTRATION OF LUMINESCENCE CENTERS IN  
LASER CRYSTAL  
A66-33053
- TOMASHEVSKII, E. E.  
POLYMETHYLMETHACRYLATE AND POLYSTYRENE EXPOSURE  
TO RUBY AND NEODYMIUM-GLASS LASER RADIATION,  
NOTING APPEARANCE OF EPR  
A67-10075
- TOMITA, W. K.  
THERMAL HIGH RESOLUTION RECORDING USING MOVING  
LASER SPOT ON METALLIC AND ORGANIC THIN FILMS  
A67-16586
- TOMIYASU, K.  
LASER BIBLIOGRAPHY JULY- DECEMBER 1965, INCLUDING  
REFERENCES TO HOLOGRAMS  
A66-39541
- BIBLIOGRAPHY ON LASERS COVERING MODES, SCATTERING  
MECHANISMS, QUANTUM ELECTRODYNAMICS, MATTER-  
RADIATION INTERACTION, PLASMA, HOLOGRAPHY AND  
OPTICS  
A67-17890
- TOMLINSON, J. L.  
MAGNETIC DOMAIN PATTERNS IN THIN FERROMAGNETIC  
FILMS USING 10 MILLIWATT HELIUM-NEON LASER  
N66-30158
- TOMLINSON, R. G.  
THRESHOLD DATA FOR RUBY AND NEODYMIUM LASER  
PULSE-INDUCED BREAKDOWN IN XE, AR, KR, NE,  
HE, OXYGEN, NITROGEN, AIR AND CARBON DIOXIDE  
A66-26191
- TOMLINSON, W. J.  
HYSTERESIS PHENOMENA IN HE- NE GAS LASER IN AXIAL  
MAGNETIC FIELD AND POLARIZATION OF OSCILLATING  
MODE WITHIN CERTAIN TUNING REGION  
A66-29385
- TOMME, W. J.  
LASER VELOCIMETER MEASUREMENT OF POINT VELOCITIES  
IN TURBULENT LIQUID FLOW IN PIPE, USING  
STATISTICAL ANALYSIS TO VERIFY RESULTS  
AIAA PAPER 67-179  
A67-18511
- TONON, G.  
ENERGY SPECTRA OF IONS EMITTED BY BERYLLIUM,  
CARBON AND MOLYBDENUM HEATED BY LASER  
A66-25479
- TORALDO DI FRANCIA, G.  
LASER RADIATION COHERENCE PROPERTY DETERIORATION  
AND MOLECULAR SCATTERING DURING PROPAGATION  
THROUGH TURBULENT ATMOSPHERE  
A66-27131
- TOU, C. P.  
SPECTRAL COMPOSITION OF LASER LIGHT WITHIN  
FRAMEWORK OF THEORY OF NONLINEAR OPTICAL EFFECTS  
A66-37360

- TOWNE, M. K.**  
PRODUCTION ENGINEERING MEASURE TO IMPROVE CRYSTAL QUALITY AND PRODUCTION YIELD OF RUBY LASER CRYSTAL GROWTH  
QPR-2 A66-30291
- PRODUCTION ENGINEERING MEASURE FOR RUBY LASER RODS  
QPR-3 A67-15107
- TOWNES, C. H.**  
PROPERTIES OF SELF-TRAPPED LIGHT FILAMENTS NOTING STIMULATED RAMAN EMISSION AND CREATION, CONTAINMENT AND TERMINATION MECHANISMS A67-16648
- NEW CLASS LIGHT FILAMENT IDENTIFIED IN RAMAN RADIATION OF INTENSE RUBY LASER BEAM  
NASA-TM-X-57831 A66-33863
- GAS LASER RESEARCH, ATOMIC, MOLECULAR, AND INFRARED SPECTROSCOPY TECHNIQUES, AND INTENSE LASER BEAM INTERACTION WITH MATTER  
AFCLR-66-727 A67-19224
- TOWNSEND, R. L., JR.**  
THERMALLY INDUCED EFFECTS ON RUBY AND NEODYMIUM IN GLASS LASER RODS  
AFCLR-66-57 A66-26341
- TOWNSEND, W. G.**  
VAPORIZATION OF THIN METALLIC FILMS WITH FOCUSED LASER BEAM, COMPARING THEORETICAL AND EXPERIMENTAL RESULTS PREPARED BY USING PULSED HIGH PRESSURE HELIUM-NEON LASER A67-15478
- TOZER, B. A.**  
LASER BEAM ENERGY PROFILE DETERMINED BY MULTIPLE-LAYER ALUMINUM FOIL TECHNIQUE A66-31217
- TRAMMELL, W. V.**  
PULSED LASERS AS MACHINE TOOLS FOR MATERIAL REMOVAL, NOTING TESTS ON TITANIUM, ALUMINUM OXIDE, STEEL, ETC A67-15308
- TREAT, R. P.**  
OPTICAL LENGTH VARIATIONS IN LASER AMPLIFIERS DETERMINED DURING PUMPING AND AMPLIFICATION, USING INTERFEROMETRY A66-25999
- SPECTRAL HOLE BURNING AND CROSS RELAXATION EFFECTS ON STEADY STATE GAIN SATURATION OF LASER AMPLIFIER WITH INHOMOGENEOUSLY BROADENED LINEWIDTH A66-40098
- TREGELLAS-WILLIAMS, J.**  
MONTE CARLO TECHNIQUE TO DETERMINE TOTAL ENERGY AND ENERGY DISTRIBUTION IN LASER CRYSTAL DUE TO OPTICAL PUMPING A66-26028
- TREVELYAN, B.**  
DETECTION OF VERY LOW LEVELS OF MODULATION ON LASER BEAM TO DETERMINE PERFORMANCE OF MICROWAVE LIGHT MODULATORS A66-29682
- TRIAS, J. A.**  
RECIRCULATION OF LIQUID THROUGH CELL AND EXTERNAL HEAT EXCHANGER TO SOLVE PROBLEM OF REPEATED FLASHING IN EUROPIUM CHELATE LASERS A66-39108
- TROITSKIY, YU. V.**  
MULTIMODALITY OF GAS LASER IN RESONATOR WITH ONE DIRECTION TRAVELING WAVE PROPAGATION A67-11315
- TROSHIN, B. I.**  
MULTIMODALITY OF GAS LASER IN RESONATOR WITH ONE DIRECTION TRAVELING WAVE PROPAGATION A67-11315
- TRUE, C.**  
CEREBRAL CORTEX OF DOG AS AFFECTED BY LASER RADIATION A66-82035
- TRUFFERT, A.**  
CARBON DIOXIDE LASER PRINCIPLE AND PERFORMANCE A66-33247
- TRUKHAN, V. G.**  
TIME STRUCTURE AND AMPLITUDE SELF-MODULATION OF EMISSION FROM GA AS INJECTION LASER OBSERVED, USING ELECTRON-OPTICAL CONVERTER A67-17756
- TSAI, C. S.**  
CONFIGURATIONS FOR REALIZATION OF MULTIPLE LASER LIGHT SCATTERING USING MICROWAVE ACOUSTIC WAVES AND TWO PORRO PRISMS A66-42636
- TSAREGRADSKII, V. B.**  
STEADY STATE OSCILLATIONS OF MOLECULAR BEAM LASER WITH INHOMOGENEOUS SINUSOIDAL FIELD IN RESONATOR A67-17234
- GENERALIZED CALLEN- WELTON THEOREM APPLIED TO CALCULATION OF MASER OSCILLATIONS IN AMPLIFICATION AND GENERATION REGIMES, DETERMINING NOISE SPECTRAL ENERGY AND SPECTRAL LINE WIDTH A67-16350
- OSCILLATION OF MASER WITH SINUSOIDAL DISTRIBUTION OF RESONATOR FIELD ALONG AXIS OF MOLECULAR MOTION A67-17234
- TSARENKOV, B. V.**  
RECOMBINATION RADIATION FROM GA AS P-N JUNCTIONS WITH AND WITHOUT FABRY- PEROT RESONATOR, NOTING PARAMETER DEPENDENCE ON CURRENT DENSITY A66-40314
- VOLT-AMPERE CHARACTERISTICS AND OTHER PROPERTIES OF GA AS LASERS WITH TELLURIUM AND ZN-DOPED EPITAXIAL P-N JUNCTION A67-10080
- CONTINUOUS COHERENT RADIATION OF GA AS SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT AMBIENT TEMPERATURE OF 77 DEGREES K A67-10548
- CONTINUOUS COHERENT RADIATION OF GA AS SEMICONDUCTOR LASER WITH EPITAXIAL P-N JUNCTION AT AMBIENT TEMPERATURE OF 77 DEGREES K A67-11056
- I- V CHARACTERISTIC OF GA AS DIODE WITH FABRY- PEROT RESONATOR, NOTING VARIATIONS DURING AMPLIFICATION TO GENERATION TRANSITION A67-15132
- RECOMBINATION RADIATION OF P-N JUNCTIONS IN GA AS WITH AND WITHOUT FABRY- PEROT CAVITY, DISCUSSING NONEQUILIBRIUM CURRENT CARRIER KINETICS AND I-V CHARACTERISTICS A67-18934
- TSIKUNOV, V. N.**  
CRYSTAL MOTION EFFECT ON TIME BEHAVIOR OF LASER GENERATION MODE, USING HIGH SPEED PHOTOGRAPHY AND OSCILLOGRAMS A66-29725
- STIMULATED EMISSION SPECTRUM IN AXIAL-MODE MODEL OF PLANE RESONATOR IN STATIONARY GENERATION REGIME A66-38127
- EFFECT OF DIFFUSION OF EXCITATION ON CONDITIONS OF MULTIMODE GENERATION IN LASER RADIATION A67-13207
- TSUYUKI, T.**  
HIGH TEMPERATURE FLOW CHARACTERISTICS IN FREE PISTON SHOCK TUBE MEASURED BY MEANS OF PULSED LIGHT OF HE- NE GAS LASER A66-35353
- TSVETKOV, V. V.**  
TIME STRUCTURE AND AMPLITUDE SELF-MODULATION OF EMISSION FROM GA AS INJECTION LASER OBSERVED, USING ELECTRON-OPTICAL CONVERTER A67-17756
- TSVIRKO, IY. A.**  
LASER BEAM-INDUCED RECRYSTALLIZATION OF AMORPHOUS GE SEMICONDUCTOR THIN FILMS PREPARED BY THERMAL DEPOSITION ON GLASS A67-13839
- TUCKER, J. W.**  
Q-SPOILING OF RUBY LASER BY OPTICAL PUMPING IN INTENSE INHOMOGENEOUS MAGNETIC FIELD WITH REDUCED GAIN A67-12505

MAGNETIC LOW TEMPERATURE Q-SWITCHING OF RUBY LASER N67-12648

TULUB, A. V.  
NONLINEAR ZEEMAN EFFECT FOR GAS LASER A66-34181

TUNITSKII, L. N.  
OPTICAL MASER OSCILLATION LINES IN HF DISCHARGE IN MIXTURE OF AR AND BR A67-18545

TURKOV, IU. G.  
PARASITIC INTERNAL OSCILLATIONS IN LASER CRYSTAL WITH DIELECTRIC ROD CAUSED BY TOTAL REFLECTION FROM GENERATRIX OF CYLINDRICAL SAMPLE A66-41477

COMPUTER CALCULATIONS PERMITTING INVESTIGATION OF TIME CHARACTERISTICS OF RADIATION IN INVESTIGATION OF LASER WITH PASSIVE CELL A67-13962

STEADY STATE LASER DESIGN, COMPARING BALANCE METHOD WITH METHOD BASED ON QUASI-CLASSICAL THEORY A67-20245

TURKOV, J. G.  
SEMICLASSICAL AND RATE EQUATIONS COMPARED FOR DETERMINATION OF OUTPUT POWER OF STEADY STATE RUBY LASER A67-16628

TURNER, A. F.  
LASER DAMAGE OF THIN FILMS - ENERGY DENSITY THRESHOLDS DETERMINED FOR SINGLE QUARTERWAVE AND HALF-WAVE FILMS VACUUM EVAPORATED ON GLASS AND QUARTZ SUBSTRATES AD-633554 N66-34015

TURNER, E. H.  
ELECTRO-OPTIC LIGHT MODULATION USING POCKEL AND KERR EFFECTS IN CRYSTALS FOR COMMUNICATIONS APPLICATIONS, USING LASERS A66-42811

TURUNOV, A. T.  
CRYSTAL MOTION EFFECT ON TIME BEHAVIOR OF LASER GENERATION MODE, USING HIGH SPEED PHOTOGRAPHY AND OSCILLOGRAMS A66-29725

## U

UGLOV, A. A.  
HEATING PROCESS IN LASER WELDING OF METAL SHEETS, TAKING INTO ACCOUNT ENERGY DISTRIBUTION, HEAT TRANSFER AND FLUX DENSITIES A66-29989

TEMPERATURE DISTRIBUTION IN TWO-LAYER PLATE DURING WELDING BY LASER LIGHT FLUX A66-40194

TEMPERATURE DISTRIBUTION IN TWO-LAYER PLATE DURING WELDING BY LASER LIGHT FLUX A67-17548

TEMPERATURE DISTRIBUTION IN BILAYER SHEET DURING WELDING WITH LASER BEAM JPRS-37856 N66-39411

ULTEE, C. J.  
PHOTODISSOCIATION LASER SYSTEM, DISCUSSING OUTPUT ENERGY DEPENDENCE ON PRESSURE, TEMPERATURE AND NUMBER OF SUCCESSIVE OPTICAL PUMPING FLASHES A66-37781

URNIS, I. E.  
COHERENCE IN RADIATION PEAKS OF RUBY LASER STUDIED THROUGH INTERFERENCE FIELD A66-33510

COHERENCE IN RADIATION PEAKS OF RUBY LASER STUDIED THROUGH INTERFERENCE FIELD A66-42124

URTIW, P. A.  
OPTICAL SYSTEM FOR SCHLIEREN RECORDING, DEFLECTION MAPPING, SHADOWGRAPHY AND INTERFEROMETRY ACHIEVED FOR LASER LIGHT, USED IN RECORDING OF REFRACTIVE INDEX FIELDS A66-26307

TRANSITION TO DETONATION IN GASEOUS MEDIUM EXPERIMENTALLY STUDIED, BASED ON SELF-SUSTAINED DETONATION FRONT AND ADAPTATION OF AMPLITUDE MODULATED GIANT PULSE LASER SYSTEM A67-13500

USPENSII, A. V.  
PERFORMANCE OF TWO-PHOTON LASER OPERATING IN CONTINUOUS WAVE MODE, DERIVING FORMULA FOR PULSE FREQUENCY A66-28166

HYDROGEN ATOM BEAM CHARACTERISTICS, DISCUSSING SIGNAL POWER, GENERATING FREQUENCY, RADIATION SIGNAL DAMPING AND HYDROGEN ATOM RELAXATION TIME A66-28289

TWO-LASER CAVITY IN TANDEM TO RESOLVE COMPONENTS WITH HOMOGENEOUSLY BROADENED / DOPPLER/ LINE A66-36720

EXCITATION OF AXIAL OSCILLATION MODES IN SEMICONDUCTOR LASERS ANALYZED, BASED ON RATE EQUATIONS FOR CHEMICAL POTENTIALS OF CARRIERS AND NUMBER OF PHOTONS A66-37687

OPTICAL COUPLING USING GALLIUM ARSENIDE LASER FOR VARIATION OF FREQUENCY OF DIODE EMISSION THROUGH SMALL CHANGE IN CURRENT DENSITY A66-38920

PULSED INDUCED EMISSION IN HYDROGEN BEAM LASER FOR CASE OF TWO RELAXATION TIMES, DETERMINING POLARIZATION ONLY BY NUMBER OF ACTIVE PARTICLES IN RESONATOR A66-41091

PERFORMANCE OF TWO-PHOTON LASER OPERATING IN CONTINUOUS WAVE MODE, DERIVING FORMULA FOR PULSE FREQUENCY A67-13292

OPTICAL COUPLING USING GALLIUM ARSENIDE LASER FOR VARIATION OF FREQUENCY OF DIODE EMISSION THROUGH SMALL CHANGE IN CURRENT DENSITY A67-16390

## V

VAINSHTEIN, B. K.  
LASER AS SOURCE OF OPTICAL FOURIER ANALYSIS OF ATOMIC STRUCTURE OF CRYSTALS A67-16921

VALAKH, M. IA.  
OPTICAL METHODS AND EQUIPMENT USED IN CHECKING SURFACE FINISH AND VOLUME AND SURFACE INHOMOGENEITIES OF ACTIVE MEDIA AND INTERFEROMETRIC MIRRORS OF LASERS A67-13143

VAN DER ZIEL, A.  
DISCHARGE CURRENT AND LASER LIGHT NOISE MEASUREMENTS EFFECT IN GAS DISCHARGE HELIUM-NEON LASER, USING EQUIVALENT CIRCUIT A66-38240

VAN DER ZIEL, J. P.  
MAGNETIZATION INDUCED BY CIRCULARLY POLARIZED LASER LIGHT INCIDENT ON NONABSORBING MATERIAL, IN ABSENCE OF EXTERNAL MAGNETIC FIELD, IN DOPED CALCIUM FLUORIDE PROPORTIONAL TO LIGHT INTENSITY AND VERDET CONSTANT A66-26142

VAN HAERINGEN, W.  
NONLINEAR MEDIUM ANISOTROPY AND SATURATION EFFECTS ON ORIENTATION OF POLARIZATION ELLIPSE OF GAS LASER MODE A67-17823

VAN RAALTE, J. A.  
ELECTRO-OPTIC INTRA-CAVITY COLOR SWITCHING IN KRYPTON ION FABRY-PEROT LASER A67-17888

VAN TORNE, L. I.  
TRIVALENT NEODYMIUM DOPED GLASS LASER WITH INTERNAL IMPERFECTIONS DUE TO OPTICAL PUMPING EXAMINED VIA OPTICAL METALLOGRAPHY, TRANSMISSION ELECTRON MICROSCOPY AND ELECTRON DIFFRACTION TECHNIQUES A67-14927

VAN TRAN, N.  
SECOND HARMONIC GENERATED BY TRANSMITTING LASER RADIATION THROUGH TELLURIUM MONOCRYSTAL, WHILE FILTERING OUT FUNDAMENTAL FREQUENCY A66-25437

VAN UITERT, L. G.  
NEODYMIUM-DOPED YTTRIUM-ALUMINUM GARNET CRYSTAL

- LASER OSCILLATOR AS REGENERATIVE AMPLIFIER OF NOISE A66-26212
- COHERENT EMISSION FROM TRIVALENT HOLMIUM IONS IN RARE EARTH SUBSTITUTED YTTRIUM ALUMINUM GARNET, NOTING THREE ENERGY TRANSFER COMBINATIONS IN YAG A66-28690
- YTTRIUM VANADATE CRYSTALS GROWN AND PROCESSED FOR OPTICAL PURPOSES A66-35434
- VAND, V.**  
C W HE- NE LASER MEASUREMENT OF LIGHT SCATTERING IN CRYSTALS NOTING LASER OUTPUT, PERFORMANCE AND CRYSTAL IMPERFECTIONS A66-35402
- LIGHT SCATTERING TECHNIQUES FOR CRYSTAL EVALUATION AFCL-66-119 N66-26436
- VANIER, J.**  
MAGNETIC FIELD GRADIENT RELAXATION MECHANISM BY RANDOM EXCITATION OF TRANSITIONS IN F EQUALS 1 LEVEL OF GROUND STATE OF HYDROGEN ATOMS IN MASER A67-16635
- VANIUKOV, M. P.**  
FAST-ACTING FLUID SEAL FOR Q-FACTOR MODULATION OF NEDODYMIUM GLASS LASER A66-27595
- IONIZATION OF AIR WITH LASER RADIATION IN SPIKE MODE A66-31150
- FAST-ACTING FLUID SEAL FOR Q-FACTOR MODULATION OF NEDODYMIUM GLASS LASER A66-42729
- VARFLOMEEV, A. A.**  
RECORDING OF LIGHT-INDUCED LIGHT SCATTERING USING LASER BEAM, CALCULATING CROSS SECTION OF PHOTON-PHOTON SCATTERING A66-31175
- VARGA, P.**  
HIGH POWER LASER BEAM POLARIZATION DIRECTION EFFECTS ON ELECTRON EMISSION FROM AG SURFACE A67-18759
- VARSANYI, F.**  
NONEQUILIBRIUM POPULATION BUILDUP AND DETECTION FOR IR SOLID STATE LASERS AND I R-OPTICAL DOUBLE RESONANCE IN LANTHANUM CHLORIDE CRYSTAL A66-26177
- VARSHALOVICH, D. A.**  
COHERENT AMPLIFICATION OF RF RADIATION IN COSMIC SPACE A66-42754
- COHERENT AMPLIFICATION OF RF RADIATION IN COSMIC SPACE A67-10836
- VASILENKO, L. S.**  
COMPETITION OF TRANSITIONS AND EMISSION IN HE- NE LASER, USING RESONATOR WITHOUT DISPERSING PRISM A66-33514
- COMPETITION OF TRANSITIONS AND EMISSION IN HE- NE LASER, USING RESONATOR WITHOUT DISPERSING PRISM A66-42127
- VASSEUR, P.**  
ELECTROSTATIC PROBE MEASUREMENTS OF VELOCITY DISPLACEMENT AND ELECTRON DENSITY OF PLASMA USING LASER COMPARED WITH MEASUREMENTS USING MICROWAVE INTERFEROMETER A66-28269
- VATULEV, V. N.**  
FRACTURE MECHANISM OF TRANSPARENT CRYSTALS INTERACTING WITH RUBY LASER BEAM A67-13128
- VATULOV, V. M.**  
SELF-FOCUSING OF RUBY LASER BEAM IN NA CL CRYSTALS A67-12481
- VAUGE, C.**  
LASER OSCILLATION EFFECT ON CHARACTERISTICS OF ELECTRON GAS OF HELIUM-NEON LASER PLASMA STUDIED IN TERMS OF WAVE ATTENUATION IN PLASMA GUIDE A66-43006
- MICROWAVE MODULATION OF HELIUM-NEON LASER INTENSITY STUDIED AS FUNCTION OF TEMPERATURE AND ELECTRON DENSITY A67-10260
- ELECTRON COLLISION RATE AND DENSITY CALCULATIONS FOR HE- NE LASER PLASMA A67-16598
- VAUGHAN, W. H.**  
EQUIPMENT ASSEMBLY FOR LASER MATERIALS EVALUATION PROGRAM N67-12647
- VAUTIER, PH.**  
CARBON DIOXIDE LASER PRINCIPLE AND PERFORMANCE A66-33247
- VAVILOV, V. S.**  
PHOTO EMF VARIATION WITH RADIATION POWER OF Q-SWITCH RUBY LASER INCIDENT ON SILICON CRYSTAL WITH P-N JUNCTION A66-32509
- FORCED EMISSION FROM ELECTRON-EXCITED CADMIUM SELENIDE A66-35788
- VEDAM, K.**  
C W HE- NE LASER MEASUREMENT OF LIGHT SCATTERING IN CRYSTALS NOTING LASER OUTPUT, PERFORMANCE AND CRYSTAL IMPERFECTIONS A66-35402
- VENKATACHALAM, T. K.**  
FOCUSED LASER COHERENT RADIATION-INDUCED DEGRADATION OF SOLID METHYLENE AND GAS CHROMATOGRAPHIC ANALYSIS OF REACTION PRODUCTS A66-31870
- VENKATESWARLU, P.**  
TRANSITIONS OF FIRST TWO BAND SYSTEMS OF IODINE EXCITED IN ARGON SUITABLE FOR LASER ACTION A66-42085
- VERDEYEM, J. T.**  
ELECTRON AND NEUTRAL ATOM DENSITIES IN HELIUM AND ARGON AFTERGLOW PLASMA OBTAINED BY TWO HELIUM-NEON LASER INTERFEROMETERS, NOTING TEMPORAL DEPENDENCE OF ELECTRON DECAY A66-41364
- SPATIALLY RESOLVED HE- NE LASER HETERODYNE MEASUREMENTS OF ELECTRON NUMBER DENSITIES IN WEAKLY IONIZED AR PULSED DISCHARGES A67-17272
- HELIUM-NEON LASER INTERFEROMETERS TO OBTAIN ELECTRON AND NEUTRAL ATOM DENSITIES IN HELIUM AND ARGON AFTERGLOW PLASMAS A66-4832-7 N66-25866
- PLASMA DIAGNOSTICS WITH THREE-MIRROR GAS LASER INTERFEROMETER N67-15241
- VERET, C.**  
LASER APPLICATIONS IN AEROSPACE TECHNOLOGY N67-18668
- VERIE, C.**  
SEMICONDUCTOR LASERS AND FAST IR DETECTORS, DISCUSSING IN AS, IN SB AND THREE TYPES OF MERCURY CADMIUM TELLURIDE DETECTORS A67-16668
- VESSOT, R. F. C.**  
MAGNETIC FIELD GRADIENT RELAXATION MECHANISM BY RANDOM EXCITATION OF TRANSITIONS IN F EQUALS 1 LEVEL OF GROUND STATE OF HYDROGEN ATOMS IN MASER A67-16635
- VEYRIE, P.**  
INTENSITY DISTRIBUTION AT FOCUS OF HIGH POWER LASER, NOTING MEASURING METHOD A66-28834
- TRANSMISSION OF LUMINOUS FLUX DUE TO IONIZATION OF GASES BY HIGH POWER LASER, MEASURING ENERGY ABSORPTION IN IONIZED ZONE A66-36255
- VIENOT, J. CH.**  
FREQUENCY SHIFT RELATIVE TO SPECTRAL WIDTH FOR SINGLE PULSES OF TRIGGERED LASER DETERMINED BY MEASURING VARIATIONS OF EMITTED WAVELENGTH AS FUNCTION OF TIME A66-32622
- VIEZEE, W.**  
CIRRUS CLOUD COVER OBSERVATION CAPABILITY AND

- PERFORMANCE SPECIFICATIONS FOR METEOROLOGICAL  
SATELLITE LIDAR  
NASA-CR-76087 N66-29977
- VILMS, J.  
MATHEMATICAL MODEL OF GA AS INJECTION LASER  
APPLIED IN DETERMINING MAXIMUM OBTAINABLE POWER  
OUTPUT, USING RATE EQUATIONS OF ELECTRON AND  
PHOTON DENSITIES AND THERMAL RESISTANCE FOR  
OPTIMUM VALUE A66-26572
- GALLIUM ARSENIDE INJECTION LASER OPTIMIZATION  
FOR MAXIMUM POWER OUTPUT  
ECOM-2613 N66-24779
- VINCENT-GEISSE, J.  
OPTICAL PATHS AND VARIABLE-CONTRAST INTERFERENCE  
AT MICHELSON INTERFEROMETER WHICH ADDS TWO GROUPS  
OF TWO LASER COHERENT WAVES A67-17636
- VINETSKII, V. L.  
LIGHT ABSORPTION BY FREE CURRENT CARRIERS ROLE IN  
KINETIC EQUATIONS OF SEMICONDUCTOR  
LASER/RADIATION SYSTEM A66-34691
- LASER TYPE REGIME OF SEMICONDUCTOR HAVING  
RADIATION INDUCED BY IMPURITY BAND TRANSITIONS OF  
CURRENT CARRIERS A67-13137
- LIGHT ABSORPTION BY FREE CURRENT CARRIERS ROLE IN  
KINETIC EQUATIONS OF SEMICONDUCTOR LASER/RADIATION  
SYSTEM A67-14376
- VITRIKHOVSKII, M. I.  
LASER-GENERATION-TYPE LUMINESCENCE CD S- CD SE  
CRYSTALS EXPOSED TO DOUBLE PHOTON EXCITATION FROM  
RUBY LASER A66-27647
- VITRIKHOVSKII, N. I.  
LUMINESCENCE IN CADMIUM SULFIDE MIXED CRYSTALS OF  
WIDELY VARYING COMPOSITION IN PRESENCE OF  
EXCITATION BY RUBY LASER EMISSION A67-13153
- VLADIMIROV, V. I.  
DISINTEGRATION OF ALKALI HALIDE SINGLE CRYSTALS,  
POLYMERS AND GLASSES UNDER LASER RADIATION, NOTING  
PARAMETERS OF DISINTEGRATION REGION MAGNITUDE  
A66-34681
- LASER BEAM EFFECT ON HYDRODYNAMIC BEARINGS,  
DISCUSSING MICROCRACKS AND CRITICAL ENERGY,  
EXPLAINING BREAKDOWNS A66-41409
- DISINTEGRATION OF ALKALI HALIDE SINGLE CRYSTALS,  
POLYMERS AND GLASSES UNDER LASER RADIATION, NOTING  
PARAMETERS OF DISINTEGRATION REGION MAGNITUDE  
A67-14367
- VOLKOVA, N. V.  
LI F SINGLE CRYSTAL DESTRUCTION AS FUNCTION OF  
LASER BEAM ENERGY, EXAMINING DISLOCATION PATTERN  
ARISING FROM CRACK PROPAGATION A67-10071
- KINETICS OF FORMATION AND HEALING OF DAMAGE CAUSED  
BY LASER PULSE IN LITHIUM FLUORIDE SINGLE CRYSTALS  
A67-17057
- VOLLMER, J.  
LASER RADIATION TO DETERMINE ELECTRON DENSITY IN  
DENSE HIGH TEMPERATURE PLASMA A66-27507
- TRAVELING WAVE MASER CONSISTING OF PARAMAGNETIC  
CRYSTAL /CHROMIUM DOPED RUTILE/, SLOW WAVE CIRCUIT  
AND FERRITE ISOLATOR, DISCUSSING PERFORMANCE,  
STAGGER TUNING, ETC A67-11787
- LASER MEASUREMENT OF ELECTRON DENSITY IN DENSE,  
HIGH TEMPERATURE PLASMA N67-13686
- VOLOSHIN, A. E.  
MEASURING DEVICE FOR PULSED LASER OUTPUT POWER  
USING BOLTOMETER, AMPLIFIER AND OSCILLOSCOPE  
A66-29701
- VOLZE, J.  
PUMPING OF ORGANIC DYES IN ORGANIC SOLVENTS, USING  
PULSED RUBY LASER A67-12515
- VONDERHAAR, D. F.  
LASER INDUCED PLASMA DENSITY MEASUREMENT USING  
MULTIPLE BEAM INTERFEROMETRY A66-41630
- VORONKO, I. K.  
CALCIUM FLUORIDE-CERIUM FLUORIDE WITH NEODYMIUM  
ADDITIONS AS ACTIVE MEDIUM FOR LASERS, DISCUSSING  
ABSORPTION AND LUMINESCENCE SPECTRA AND INDUCED  
RADIATION A67-16922
- VORONOV, G. S.  
SPATIAL DISTRIBUTION OF ELECTRICAL FIELD OBTAINED  
BY FOCUSING RADIATION OF RUBY LASER A66-25967
- MULTIPHOTON IONIZATION OF KRYPTON AND ARGON BY  
RUBY LASER RADIATION MAY OCCUR BY ABSORPTION  
A66-36721
- MULTIPHOTON IONIZATION OF XENON ATOM IN POWERFUL  
ELECTRIC FIELD BY RUBY LASER RADIATION A66-39545
- MULTIPHOTON IONIZATION OF KRYPTON ATOM BY RUBY  
LASER RADIATION A67-18796
- VOROPAIEV, N. D.  
LASER MODE OPERATION IN PRESSURE OF RADIATION  
ABSORBING IMPURITY ANALYZED BY EXTENDED THOMSON  
TYPE SYSTEM A66-31558
- VOS, J. J.  
LASER RADIATION EFFECT ON EYE - RETINAL BURNS,  
IMAGERY, AND SAFETY PRESCRIPTION  
TDC-46027 N66-39840
- WAGNER, P. R.  
SEMICONDUCTOR INJECTION LASERS  
REPT.-8 N66-27687
- WAGNER, W. G.  
DISCREPANCY BETWEEN CALCULATED AND EXPERIMENTAL  
VALUES FOR RAMAN GAIN IN PULSED LASER SUGGESTS  
HIGHER ENERGY DISTRIBUTION DUE TO LIGHT TRAPPING  
OR BRILLOUIN SCATTERING A66-26157
- EFFECT OF FLUCTUATING LASER PUMP ON STIMULATED  
RAMAN SCATTERING, NOTING GROWTH OF COUPLED  
STOKES-ANTI-STOKES WAVES IN PRESENCE OF TWO-MODE  
PUMP A66-26158
- HIGH ENERGY DIFFRACTION LIMITED RAMAN LASER  
REALIZATION STUDIES  
AD-636250 N66-37176
- WALSH, D.  
Q-SWITCHING OF RUBY LASER USING CELL CONTAINING  
CHLOROALUMINUM PHTHALOCYANINE IN CHLORONAPHTHALENE  
TO OBTAIN GIANT PULSES A67-10448
- WALTER, W. T.  
PULSED GAS DISCHARGE LASERS NOTING REQUIRED  
ENERGY LEVEL FOR MAXIMUM EFFICIENCY, EXPERIMENTAL  
TECHNIQUES AND RESULTS A67-16650
- WANDINGER, L.  
MATHEMATICAL MODEL OF GA AS INJECTION LASER  
APPLIED IN DETERMINING MAXIMUM OBTAINABLE POWER  
OUTPUT, USING RATE EQUATIONS OF ELECTRON AND  
PHOTON DENSITIES AND THERMAL RESISTANCE FOR  
OPTIMUM VALUE A66-26572
- P-N JUNCTION LASERS FOR SHORT RANGE  
COMMUNICATIONS, EXAMINING DESIGN, TECHNOLOGICAL  
PROBLEMS AND PERFORMANCE A66-31956
- SEMICONDUCTOR LASER ARRAY STRUCTURE WITH COMMON  
N-TYPE SUBSTRATE AND INDIVIDUAL CONTACTS TO  
P-LAYER FOR HIGHER OPTICAL POWER OUTPUT  
A67-10023
- GALLIUM ARSENIDE INJECTION LASER OPTIMIZATION  
FOR MAXIMUM POWER OUTPUT  
ECOM-2613 N66-24779
- WANG, C. C.  
SECOND HARMONIC GENERATION OF LIGHT ANALYZED,

- STRESSING SATURATION EFFECTS OCCURRING AT HIGH LASER POWER, SOLVING NONLINEAR MAXWELL EQUATIONS  
A66-26144
- LENGTH DEPENDENT THRESHOLD DATA FOR STIMULATED RAMAN EMISSION IN LIQUIDS, NOTING CORRELATION BETWEEN LASER BEAM SELF-FOCUSING AND ONSET OF RAMAN EMISSION  
A66-30157
- LINEAR ABSORPTION EFFECT ON THRESHOLD FOR SELF-FOCUSING OF LASER BEAM IN CADMIUM SULFIDE, NOTING VARIATION OF ABSORPTION COEFFICIENT  
A66-31537
- NONLINEAR OPTICS EMPHASIZING PARAMETRIC OSCILLATION, SELF-FOCUSING AND TRAPPING OF LASER BEAMS AND STIMULATED RAMAN, RAYLEIGH AND BRILLOUIN SCATTERING, USING MAXWELL EQUATIONS AND ELECTRIC DIPOLE APPROXIMATION  
A66-42810
- CONVERSION EFFICIENCY AND THRESHOLD OF STIMULATED RAMAN EMISSION IN BENZENE, NITROBENZENE, TOLUENE, AND CARBON DISULFIDE - DEFENDER PROJECT  
A056-F N66-36239
- WANG, F. F. Y.  
TEMPERATURE DEPENDENCE OF THRESHOLD FOR STIMULATED EMISSION OF Nd TRIVALENT ION IN SEVERAL HOST LATTICES ESTIMATED FROM INTENSITY VARIATION OF LASER ACTIVE FLUORESCENCE COMPONENT  
A67-11085
- WANIEK, R. W.  
FARADAY ROTATION OBTAINED WITH PULSED HIGH-FIELD MAGNETS FOR CONTROLLING LASER CAVITIES  
A66-35380
- FARADAY ROTATORS FOR HIGH POWER LASER CAVITIES AND INTERACTION OF MACROSCOPIC PARTICLES WITH COHERENT LIGHT BEAMS  
AFOSR-66-1090 N66-36913
- FARADAY ROTATORS FOR HIGH POWER LASER CAVITIES  
N66-36914
- WARD, J. H.  
READOUT TECHNIQUE FOR LASER FOG DISDROMETER  
A66-33346
- WARD, J. H., III  
COHERENT TRANSMISSION OF OPTICAL RADAR FROM LASER SOURCE AND USE OF RF SUBCARRIERS PLACED ON OPTICAL BEAMS FOR WIDEBAND COMMUNICATIONS PURPOSES  
A66-28404
- WARTER, P. J., JR.  
NONUNIFORM PUMPING EFFECTS ON NEAR-AXIAL LOW-ORDER TRANSVERSE MODE STRUCTURE IN SOLID STATE LASER CAVITY  
A66-31087
- WATANABE, Y.  
LASER INDUCED PHOTOCONDUCTIVITY IN CADMIUM SULFIDE SINGLE CRYSTALS  
REPT.-661 N66-37870
- WATSON, B. C.  
ETCHING METHODS TO VISUALIZE LATTICE DISLOCATIONS AND GRAIN BOUNDARIES IN CZOCHRALSKI GROWN CALCIUM TUNGSTATE CRYSTALS DOPED WITH NEODYMIUM FOR LASER APPLICATION  
A67-19565
- WATSON, H. J.  
LASER DOPPLER VELOCIMETER FOR MEASURING LOCALIZED FLOW VELOCITIES IN LIQUIDS  
A66-27053
- LASER DOPPLER VELOCIMETER FOR GAS AND LIQUID FLOW VELOCITY MEASUREMENT  
A66-42557
- WATSON, W.  
HORIZONTAL DEFLECTION IN TV DISPLAY PRODUCED BY BRAGG REFLECTION OF LASER LIGHT BY ULTRASONIC WAVES IN WATER  
A66-42816
- WEAVER, L. A.  
RADIATIVE CASCADE PATTERNS IN HELIUM-NEON GAS SYSTEM USING IDEALIZED MODEL, COMPUTING SPONTANEOUS DECAYS WHICH ARE COMPARED WITH LASER EXPERIMENTS  
A66-28699
- WEAVER, L. A. C.  
SPECTROSCOPIC AND MICROWAVE INVESTIGATION OF LASERING PLASMAS, ELECTRON GAS, AND EXCITED STATE POPULATIONS OF ACTIVE MEDIUM  
AFCL-66-89 N66-26570
- WEBB, C. E.  
ELECTRON IMPACT EXCITATION MECHANISM OF ARGON-ION CONTINUOUS AND LONG PULSE LASERS  
A66-26206
- WEBER, H.  
APPROXIMATE ABSOLUTE VALUES OF PUMPING POWER, THRESHOLD POWER AND CRITICAL EXCESS POPULATION FOR RUBY LASER DETERMINED FROM RELATIVE FLASH TUBE INTENSITY MEASUREMENTS  
A67-10245
- ABRUPT TRANSMISSION CHANGE DURING RUBY LASER EMISSION RESULTING FROM PUMPING WITH XENON FLASH LAMP  
A67-15649
- RUBY LASER MODE LOCKING AND MODE COMPETITION USING RG-8 FILTER AS PASSIVE MODULATOR  
A67-20147
- WEBER, H. P.  
SECOND HARMONIC FREQUENCY GENERATION OBTAINED IN PROCESS OF OPTICAL MIXING OF COLLINER NEODYMIUM LASER BEAMS IN POTASSIUM DIHYDROGEN PHOSPHATE  
A66-37550
- WEBER, H. J.  
OPTICAL PROPERTIES OF CRYPTOCYANINE NOTING TRANSIENT DECAY OF FLUORESCENCE, USING RUBY LASER AND TRANSMISSION OF METHANOL SOLUTION  
A66-40103
- TRANSIENT AND STEADY STATE IR EMISSION FROM LOW-LYING VIBRATIONAL LEVELS OF CARBON DIOXIDE IN LASER SYSTEMS, USING DC DISCHARGE  
A67-16630
- WEICHEL, H.  
EXPANSION VELOCITY OF LUMINOUS FRONT OF PLASMA PLUME GENERATED BY GIANT PULSE LASER  
A67-13573
- ELECTRON DENSITY, OPTICAL THICKNESS AND TEMPERATURE OF RUBY LASER-INDUCED CARBON PLASMA  
A67-16654
- WEIDLICH, W.  
FOKKER-PLANCK EQUATION APPLIED TO LASER UNDER INFLUENCE OF QUANTUM FLUCTUATIONS CONNECTED WITH DISSIPATION, PUMPING AND CAVITY THERMAL NOISE, NOTING DISTRIBUTION AND CORRELATION FUNCTION  
A66-38930
- PHASE AND AMPLITUDE FLUCTUATION OF GAS AND SOLID STATE LASERS, ACCOUNTING FOR NOISE CAUSED BY PUMPING, INCOHERENT DECAY, LATTICE VIBRATIONS AND ATOMIC COLLISIONS  
A67-14949
- WEINBERG, F. J.  
OPTICAL SYSTEM FOR SCHLIEREN RECORDING, DEFLECTION MAPPING, SHADOWGRAPHY AND INTERFEROMETRY ACHIEVED FOR LASER LIGHT, USED IN RECORDING OF REFRACTIVE INDEX FIELDS  
A66-26307
- WEINER, D.  
DISCREPANCY BETWEEN CALCULATED AND EXPERIMENTAL VALUES FOR RAMAN GAIN IN PULSED LASER SUGGESTS HIGHER ENERGY DISTRIBUTION DUE TO LIGHT TRAPPING OR BRILLOUIN SCATTERING  
A66-26157
- WEISER, K.  
SEMICONDUCTOR INJECTION LASERS  
REPT.-8 N66-27687
- WELCH, N. E.  
LASER VELOCIMETER MEASUREMENT OF POINT VELOCITIES IN TURBULENT LIQUID FLOW IN PIPE, USING STATISTICAL ANALYSIS TO VERIFY RESULTS  
AIAA PAPER 67-179 A67-18511
- WELLER, J. F.  
LASER ACTION IN TRIPLY ACTIVATED BARIUM CROWN



- GLASS N66-28515
- ENERGY TRANSFER IN ACTIVATED GLASSES AND HIGH POWER LASER EMISSION N67-12646
- WELLING, H.  
EFFECTS AND PARAMETERS INFLUENCING OPTICAL PATH LENGTH WITHIN PUMPING PROCESS IN RUBY AND DOPED GLASS LASER RODS A66-31443
- WELLS, W. H.  
MODES OF TILT-MIRROR OPTICAL RESONATOR, USING SPILLOVER RADIATION TO EXTRACT COHERENT FAR IR A66-31134
- STATISTICAL MODELS USED IN COMPUTER PROGRAM TO SIMULATE ATMOSPHERE EFFECT ON LASER RECEIVER N67-15746
- WEN, C. P.  
ELECTRO-OPTIC INTRA-CAVITY COLOR SWITCHING IN KRYPTON ION FABRY-PEROT LASER A67-17888
- WENZEL, J. H.  
PULSED-MODE GAIN CHARACTERISTICS IN NEODYMIUM-DOPED SILICATE GLASS LASER EXPERIMENTALLY RELATED TO GIANT-PULSE LASER ENERGY OUTPUT A66-38396
- WESTERMEIER, H.  
C W LASER USING 3-INCH RUBY CRYSTALS WITH 15 PERCENT MIRROR TRANSMISSION, PUMPING POWER OF DOUBLE THRESHOLD VALUE AND 1.6 WATT POWER OUTPUT A67-10244
- WEXLER, B.  
ABSOLUTE DIRECT EXCITATION CROSS SECTION FROM NEUTRAL GROUND STATE FOR UPPER LEVELS OF TRANSITION IN ARGON LASER A67-12520
- WHEELER, C. B.  
HELIUM-NEON LASER USED WITH VARIOUS INTERFEROMETERS TO MEASURE RAPID ELECTRON DENSITY CHANGES IN ARGON PLASMA N67-15240
- WHINNERY, J. R.  
RADIO ELECTRONICS, DISCUSSING QUANTUM ELECTRONICS, LASERS, MICROWAVE DEVICES AND TECHNOLOGY, PLASMA PHYSICS, ETC A67-18072
- WHITE, A. D.  
LASER MIRROR TRANSDUCER DECOUPLING FROM MECHANICAL RESONANCES OF LASER CAVITY A66-35813
- HE-NE LASER FREQUENCY STABILIZATION USING FOUR AUTOMATIC FREQUENCY CONTROL / AFC / SYSTEMS A67-17965
- WHITE, M. B.  
GAS LASER WITH GENERALIZED POLARIZATION CHARACTERISTICS, NOTING ROLE OF DEGENERATE ATOMIC ENERGY LEVELS A66-36005
- ATOMIC DEGENERACY INFLUENCE ON MODE INTERACTIONS IN GAS LASER A66-39930
- WHITNEY, C. G.  
FREQUENCY MODULATION OF GaAs SEMICONDUCTOR LASER BY ULTRASONIC WAVE MODULATION OF DIELECTRIC CONSTANT A67-16671
- WHITTLE, J.  
TRANSFER EFFICIENCY OF LASER PUMPING CAVITIES WITH DIFFUSELY REFLECTING WALL DETERMINED, BASED ON APPROXIMATELY ISOTROPIC NATURE OF LIGHT INSIDE CAVITY A66-35379
- WICK, R. V.  
STIMULATED BRILLOUIN SCATTERING FROM NITROGEN AND METHANE USING GIANT PULSE LASER, NOTING CONVERGENCE ANGLE OF BACKSCATTERED BEAM SOUND, VELOCITY MEASUREMENT, ETC A66-32627
- H-2 STOKES RAMAN OSCILLATOR OPERATING AT 9755 ANGSTROMS, FINDING PERFORMANCE AS EXPECTED OF LASER OSCILLATORS WITH BEAM INSTABILITY NOT DEVELOPED A67-12516
- RUBY LASER INDUCED BREAKDOWN IN OXYGEN GAS AT HIGH PRESSURE N66-35531
- STIMULATED RAMAN EFFECT IN LIQUID STANNIC CHLORIDE AND METHANE GAS USING MEDIUM POWER RUBY LASER N66-35532
- STIMULATED BRILLOUIN EFFECT IN HIGH PRESSURE GASEOUS NITROGEN, METHANE, AND CARBON DIOXIDE USING GIANT PULSE LASER N66-35533
- EFFECT OF POWER AND PATH LENGTH ON THRESHOLD FOR STIMULATED RAMAN SPECTRA N66-35535
- WIEDER, H.  
MULTIMODE RUBY RESONATOR OUTPUT AS AFFECTED BY MODE NUMBER AND MODE DEGENERACY A66-25043
- WIDE FIELD ACTIVE IMAGING, IMAGE PROCESSING IN WHICH PICTORIAL INFORMATION IS PLACED WITHIN LASER CAVITY A66-42559
- WIEDER, I.  
ISOTOPE SHIFTS AND FERMI RESONANCE ROLE IN CARBON DIOXIDE IR LASER A66-30176
- ISOTOPE SUBSTITUTION EFFECT ON NATURAL FREQUENCIES OF VIBRATIONAL-ROTATIONAL TRANSITIONS IN DIATOMIC AND TRIATOMIC MOLECULES AND GENERATION OF NEW IR LASER FREQUENCIES A67-16634
- WIEGMAN, E. J.  
CIRRUS CLOUD COVER OBSERVATION CAPABILITY AND PERFORMANCE SPECIFICATIONS FOR METEOROLOGICAL SATELLITE LIDAR NASA-CR-76087 N66-29977
- WIGGINS, T. A.  
STIMULATED BRILLOUIN SCATTERING FROM NITROGEN AND METHANE USING GIANT PULSE LASER, NOTING CONVERGENCE ANGLE OF BACKSCATTERED BEAM SOUND, VELOCITY MEASUREMENT, ETC A66-32627
- H-2 STOKES RAMAN OSCILLATOR OPERATING AT 9755 ANGSTROMS, FINDING PERFORMANCE AS EXPECTED OF LASER OSCILLATORS WITH BEAM INSTABILITY NOT DEVELOPED A67-12516
- BRILLOUIN SPECTRA OF ACETONE, ETHYL ALCOHOL, WATER, CARBON BISULFIDE, TOLUENE, AND CARBON TETRACHLORIDE USING HELIUM-NEON LASER AND PHOTOELECTRIC DETECTION N66-35529
- RUBY LASER INDUCED BREAKDOWN IN OXYGEN GAS AT HIGH PRESSURE N66-35531
- STIMULATED RAMAN EFFECT IN LIQUID STANNIC CHLORIDE AND METHANE GAS USING MEDIUM POWER RUBY LASER N66-35532
- STIMULATED BRILLOUIN EFFECT IN HIGH PRESSURE GASEOUS NITROGEN, METHANE, AND CARBON DIOXIDE USING GIANT PULSE LASER N66-35533
- EFFECT OF POWER AND PATH LENGTH ON THRESHOLD FOR STIMULATED RAMAN SPECTRA N66-35535
- WILEY, R. H.  
FOCUSED LASER COHERENT RADIATION-INDUCED DEGRADATION OF SOLID METHYLENE AND GAS CHROMATOGRAPHIC ANALYSIS OF REACTION PRODUCTS A66-31870
- WILLIAMS, J. H.  
LASER COMMUNICATIONS SYSTEM DESIGN, DESCRIBING RANGE EQUATION, MODULATION AND DETECTION TECHNIQUES, ATMOSPHERIC EFFECTS, ETC A66-37257
- WILLIAMSON, R.  
Q-SWITCHING OF RUBY LASER USING CELL CONTAINING CHLOROALUMINUM PHTHALOCYANINE IN CHLORONAPHTHALENE TO OBTAIN GIANT PULSES A67-10448
- WILLIS, C. R.  
MODELS OF MATTER-ELECTROMAGNETIC FIELD INTERACTION FOR GAS LASERS, USING PERTURBATION THEORY A66-26216

- QUANTUM THEORY OF LASER MODEL, DERIVING KINETIC EQUATIONS FOR RADIATION AND SINGLE-PARTICLE DENSITY MATRICES, USING BOGOLIUBOV EXPANSION PROCEDURE A66-36008
- LASER MODEL OF N TWO-LEVEL SYSTEMS INTERACTING WITH RADIATION FIELD - BIBLIOGRAPHY AFCL-66-166 N66-29246
- WILMOT, D. W.  
ALL-SOLID WAVEGUIDE COMPONENTS FOR SLOT COUPLERS AND WAVEGUIDE LASER NASA-CR-76893 N66-32757
- WILMOTTE, R.  
SYSTEM DESIGN ANALYSIS OF LASER METHODS OF DEEP SPACE COMMUNICATION, EXAMINING LOCAL HETERODYNE SYSTEM / LHS/, DIRECT DETECTION SYSTEM / DDS/ AND TRANSMITTED REFERENCE SYSTEM A66-35666
- WILMOTTE, R. M.  
SYSTEM DESIGN ANALYSIS OF LASER METHODS OF DEEP SPACE COMMUNICATION, EXAMINING LOCAL HETERODYNE SYSTEM / LHS/, DIRECT DETECTION SYSTEM / DDS/ AND TRANSMITTED REFERENCE SYSTEM A67-17635
- WILSON, D. C.  
UNMODULATED LASER OUTPUT AT CONTROLLED FREQUENCY, USING CORRECTING BEATS FROM REFERENCE LASER A66-30205
- WILSON, D. T.  
METAL WALL IONIZED ARGON LASERS, DISCUSSING USE OF WATER-COOLED QUARTZ DISCHARGE CHANNELS, CW LASERS, DEVELOPMENT OF SATISFACTORY METAL, ETC A66-25555
- WILSON, J.  
PULSED NITROGEN LASER ACTION IN WIND TUNNEL-SIMULATED SUPERSONIC FLOW A66-29384
- WINER, I. M.  
QUANTITATIVE PHOTOGRAPHIC DETERMINATIONS OF LASER BEAM POWER DENSITY DISTRIBUTIONS AND Q-SWITCHED RUBY OSCILLATOR-AMPLIFIER SYSTEM DIVERGENCE CHARACTERISTICS A66-41032
- WINOCUR, J.  
AMPLITUDE AND FREQUENCY CHARACTERISTICS OF TRAVELING WAVE RING LASER A67-15777
- WINOGRADOFF, N. N.  
SURFACE ASPECTS OF THERMAL DEGRADATION OF GA AS P-N JUNCTION LASERS AND TUNNEL DIODES A67-15620
- SHALLOW DONOR INTRODUCTION IN P-TYPE GA-AS LASER RESULTS IN INCREASED EFFICIENCY OF RADIATIVE RECOMBINATION A67-17280
- WISCHNIA, H. F.  
EQUIPMENT DESCRIPTIONS AND PROCEDURES FOR LASER COMMUNICATION SATELLITE EXPERIMENT / LCSE/ NASA-CR-77462 N66-35171
- WITTE, R. S.  
NARROW SPECTRAL OUTPUTS FROM ACTIVELY Q-SWITCHED LASERS, DERIVING FRACTIONAL ENERGY EXPRESSION FOR INJECTED MODE GROUP A66-42570
- WITTEMAN, W. J.  
VIBRATIONAL EXCITATION, POPULATION INVERSION AND COUPLING OUT OF CARBON DIOXIDE-NITROGEN-WATER VAPOR LASER A66-33758
- LASER ACTION IN CLOSED MOLECULAR SYSTEM WITH MIXTURE OF CARBON DIOXIDE, NITROGEN AND WATER VAPOR, NOTING COUPLING-OUT PLATE REFLECTIVITY AND POPULATION INVERSION A66-35433
- EXCITATION AND RELAXATION MECHANISMS FOR CLOSED MOLECULAR GAS LASER A67-16631
- WITTLIFF, C. E.  
THERMALIZATION OF PLASMA BY CREATING IMPLoding SHOCK WAVE DRIVEN BY LASER ENERGY RELEASE A66-26683
- WOELPERT, D.  
HOLOGRAMS AND WAVEFRONT RECONSTRUCTION TECHNIQUES INVOLVING PRISMATIC REFRACTION OF MONOCHROMATIC AND COHERENT LASER LIGHT CAUSING INTERFERENCE PATTERN ON PHOTOGRAPHIC EMULSION A66-25144
- WOLBARSH, M. L.  
DIFFUSELY TRANSMITTING INTEGRATING SPHERE WITH SOLID STATE PHOTODIODE USED IN LASER OUTPUT MEASUREMENT A67-10445
- VISUAL ACUITY DECREMENT FROM LASER LESION IN FOVEA OF STUMP TAIL MACAQUE MONKEYS A67-16287
- WOLF, E.  
COHERENCE AND FLUCTUATIONS OF LIGHT INCLUDING STELLAR CORRELATION INTERFEROMETRY, PHOTON BUNCHING, ETC A67-17569
- WOLFF, P. A.  
OPTICAL MIXING DUE TO CONDUCTION BAND ELECTRONS IN SEMICONDUCTOR A67-12525
- TUNABLE RAMAN LASER OBTAINED BY ELECTRON MOBILITY SUBJECTED TO MAGNETIC FIELD, NOTING THRESHOLD PUMP POWER A67-16684
- WOLGA, G. J.  
GAS LASER PUMPED MICROWAVE EMISSION FOR PRODUCING CONTROLLED EXCITED STATE POPULATION FOR RF SPECTROSCOPY OF NEON A67-16638
- DOUBLE RESONANCE EFFECTS EXTENDED TO CASE OF STIMULATED EMISSION IN EXCITED STATES OF NEON, USING GAS LASER IN TRANSVERSE DC MAGNETIC FIELD A67-16645
- WOLINSKI, W.  
CALORIMETER USING ENAMELED COPPER WIRE WITH VARIABLE RESISTANCE FOR MEASURING LASER ENERGY AND OUTPUT POWER A67-13536
- NEODYMIUM DOPED OPTICAL GLASSES FOR LASER TECHNOLOGY A67-16855
- WOOD, R. W.  
LASER ILLUMINATED ELECTRO-OPTICAL IMAGING NOTING ENERGY VARIATION PARAMETERS, EQUIPMENT USED AND RESULTS OBTAINED IN TV RECEPTION A66-35531
- WOODCOCK, R.  
SATURATED ABSORPTION OF COLOR CENTERS IN GLASS SELF-Q-SWITCHED PULSES, AS IN GLASS COLORED WITH URANYL OXIDE AND ND IONS A67-16678
- WOODCOCK, R. F.  
HOMOGENIZING METHODS FOR PLATINUM-FREE LASER GLASS, AND MELTING OF HIGH-PURITY LASER GLASS IN ALL-CERAMIC SYSTEM SATR-3 N66-30525
- WRIGHT, D. L.  
PRESSURE- AND GAIN-DEPENDENT FREQUENCY SHIFT MEASUREMENTS IN STABILIZED 6328 ANGSTROM HE-NE LASER A66-42803
- WRIGHT, R. W.  
HIGH ALTITUDE ATMOSPHERIC SCATTERING OF INTENSE LIGHT FROM RUBY LASER BEAM INTERPRETED PRINCIPALLY IN TERMS OF RAYLEIGH SCATTERING FROM ATMOSPHERIC MOLECULES A67-19419
- WUERKER, R. F.  
PULSED LASER HOLOGRAPH AND PROBLEM OF OVERCOMING LIMITED COHERENCE A66-42560
- WURTZ, P.  
FLUORESCENT EMISSION OF NEODYMIUM LASER TRIGGERED BY POKKELS EFFECT AS FUNCTION OF POPULATION INVERSION A67-13201
- WYMAN, C. L.  
LASER GUIDANCE SYSTEM FOR RENDEZVOUS AND DOCKING PROVIDING DATA ACQUISITION FOR GUIDANCE COMPUTER A67-15663

## Y

- YAMAKA, E.**  
LASER OSCILLATION WITH TOTALLY REFLECTING ROOF  
PRISM AS CAVITY, NOTING OUTPUT VS MIRROR ALIGNMENT  
FOR TWO ROTATION AXES A66-29414
- YAMAMOTO, H.-I.**  
LASER AMPLIFIER THEORY USING FABRY-PEROT  
INTERFEROMETER AND LAPLACE TRANSFORM FOR  
OBTAINING TRANSIENT SOLUTIONS IN ADDITION TO  
STEADY STATE SOLUTIONS A66-39224
- YAMANAKA, C.**  
BEAM SCATTERING, INTERFEROMETRY, AND NONLINEAR GAS  
EFFECT STUDIES IN GASEOUS MATTER-LASER BEAM  
INTERACTION EXPERIMENTS REPT.-662 N66-37871
- YAMANAKA, T.**  
BEAM SCATTERING, INTERFEROMETRY, AND NONLINEAR GAS  
EFFECT STUDIES IN GASEOUS MATTER-LASER BEAM  
INTERACTION EXPERIMENTS REPT.-662 N66-37871
- YARBOROUGH, J. M.**  
OPERATION AND IMPROVEMENT OF FREQUENCY MODULATED  
AND SUPER-MODE LASERS TER-3 N66-30672
- YARIV, A.**  
FABRY-PEROT ETALON USE FOR INTERFEROMETRY AND  
LASER CONTROL, NOTING LOW ANGLE SCATTERING, LASER  
OSCILLATION, THERMAL TUNING SENSITIVITY, ETC  
A66-32619
- GA AS CRYSTAL AS ELECTRO-OPTIC MODULATOR AT 10.6  
MICRONS DUE TO SMALL CARRIER ABSORPTION, FREEDOM  
FROM INTERBAND TRANSITIONS AND HIGH RESISTIVITY  
A66-42553
- YASUOKA, Y.**  
SELECTIVE DIFFUSED JUNCTION LASER, DISCUSSING  
GA AS LASER USED FOR QUENCHING EXPERIMENT  
A66-32408
- YATSIV, S.**  
EFFECT OF FLUCTUATING LASER PUMP ON STIMULATED  
RAMAN SCATTERING, NOTING GROWTH OF COUPLED  
STOKES-ANTI-STOKES WAVES IN PRESENCE OF TWO-MODE  
PUMP A66-26158
- YEH, M.-F.**  
HIGH VOLTAGE PULSED ELECTRODELESS DISCHARGE IN  
RARE GAS AS LIGHT SOURCE FOR RUBY AND NO GLASS  
LASER EXCITATION AND OBSERVATION OF OUTPUT  
CHARACTERISTICS A66-31448
- YEH, Y.**  
HE-NE LASER HOMODYNE SPECTROMETER OBSERVATION OF  
BROADENING OF SPECTRAL PROFILE OF LIGHT SCATTERED  
FROM CARBON DIOXIDE NEAR CRITICAL TEMPERATURE AND  
DENSITY DUE TO DENSITY FLUCTUATIONS  
A66-26168
- YEVDOKIMOV, I. R.**  
BIOLOGICAL EFFECTS AND DOSIMETRY OF ABSORBED  
RADIATION FROM RUBY LASER N66-37710
- YIN, P. K.-L.**  
ENERGY LEVELS OF SIMPLE MOLECULAR GASES FOR  
POSSIBLE MOLECULAR LASER MATERIAL  
NASA-CR-80832 N67-14212
- YNGVESSON, K. S.**  
L-BAND TRAVELING WAVE MASER USING CHROMIUM DOPED  
RUTILE, DISCUSSING INVERTED SUSCEPTIBILITY AS  
FIGURE OF MERIT A66-38239
- YOKOYAMA, K.**  
CURRENT MEASURING DEVICE FOR EHV TRANSMISSION  
LINE, OBTAINING INSTANTANEOUS MAGNETIC FIELD BY  
GAUGING FARADAY ROTATION ANGLE OF LASER BEAM IN  
FLINT GLASS ROD A66-42556

- YOKOYAMA, M.**  
BEAM SCATTERING, INTERFEROMETRY, AND NONLINEAR GAS  
EFFECT STUDIES IN GASEOUS MATTER-LASER BEAM  
INTERACTION EXPERIMENTS REPT.-662 N66-37871
- YONEMITSU, H.**  
TRAVELING WAVE MASER AS PREAMPLIFIER IN GROUND  
STATION FOR SATELLITE COMMUNICATION A66-40658
- YONEZU, H.**  
SELECTIVE DIFFUSED JUNCTION LASER, DISCUSSING  
GA AS LASER USED FOR QUENCHING EXPERIMENT  
A66-32408
- YORK, C. M.**  
NEODYMIUM DOPED GLASS LASER USING SATURABLE LIQUID  
Q-SWITCH A66-41033
- YOSHIDA, S.**  
TRAVELING WAVE MASER AS PREAMPLIFIER IN GROUND  
STATION FOR SATELLITE COMMUNICATION A66-40658
- YOSHINO, K.**  
LASER INDUCED PHOTOCONDUCTIVITY IN CADMIUM SULFIDE  
SINGLE CRYSTALS REPT.-661 N66-37870
- YOUNG, C. G.**  
SUN PUMPED CONTINUOUS WAVE ONE-WATT YAG CRYSTAL  
LASER, NOTING EQUIPMENT SETUP AND OUTPUT DURATION  
A66-32620
- NEODYMIUM-GLASS LASER USING SPONTANEOUS  
AMPLIFIED EMISSION IN NONRESONANT SYSTEM TO OBTAIN  
HIGH BRIGHTNESS OUTPUT PULSE A67-15100
- YOUNG, L.**  
MULTILAYER INTERFERENCE FILTER HAVING VARIOUS  
TRANSMISSION CHARACTERISTICS, EMPHASIZING FILTERS  
WITH NARROW STOP BANDS USED TO ELIMINATE LASER  
BEAM HAZARD A67-19400

## Z

- ZAIDEL, A. N.**  
SPECTRAL ANALYSIS OF LASER DISCHARGE IN PURE AND  
IMPURE HE, OBTAINING SPECTRA OF SPARK AT VARIOUS  
PRESSURES, DETERMINING ELECTRON CONCENTRATION AT  
VARIOUS STAGES A66-40946
- INTERFERENTIAL METHOD OF TESTING HIGH RESOLUTION  
PHOTOGRAPHIC EMULSIONS, USING LASER AS LIGHT  
SOURCE A67-10832
- ZAIIKA, V. V.**  
RUBY LASER OPERATION WITH INCLINED MIRRORS  
N67-17170
- ZAITSEV, B. N.**  
LEAD AZIDE AND PENTAERYTHRIT TETRANITRATE  
EXPLOSION TRIGGERED BY LASER RADIATION A67-19315
- ZAITSEV, IU. I.**  
HELIUM-NEON LASER MULTIBEAM GENERATION IN GAS  
DISCHARGE TUBE, USING SPHERICAL MIRRORS AND  
TAPERED PLATES A66-26053
- L F FLUCTUATIONS IN EMISSION OF HE-NE GAS LASER  
MEASURED, USING FABRY-PEROT RESONATOR AND RING-  
TYPE RESONATOR A66-27186
- PHASE RELATIONS OF LONGITUDINAL MODES IN GAS LASER  
WITH ANNULAR RESONATOR A66-37663
- L F FLUCTUATIONS IN EMISSION OF HE-NE GAS LASER  
MEASURED, USING FABRY-PEROT RESONATOR AND RING-  
TYPE RESONATOR A66-43084
- ZAITSEV, V. P.**  
SPHERICAL COUPLER FOR FASTENING MIRRORS AND PLANE-  
PARALLEL PLATES AT BREWSTER ANGLE IN GAS LASER  
A66-37523
- SPHERICAL COUPLER FOR FASTENING MIRRORS AND PLANE-  
PARALLEL PLATES AT BREWSTER ANGLE IN GAS LASER

- A67-18394
- ZAKHAROV, I. U. P.**  
GALLIUM ARSENIDE P-N JUNCTION LASER DIODE,  
INJECTION CURRENT DISTRIBUTION, DENSITY AND  
EMISSION SPECTRA VARIATION A66-25934
- OPTICALLY CONNECTED LASER CONSTRUCTED ON GALLIUM  
ARSENIDE P-N JUNCTION, NOTING COHERENT RADIATION  
A66-28262
- GALLIUM ARSENIDE LASERS OPERATING AT ROOM  
TEMPERATURE INVESTIGATED, BASED ON DIFFUSION P-N  
JUNCTIONS, DISCUSSING EMISSION SPECTRUM  
A66-36070
- OPTICAL COUPLING USING GALLIUM ARSENIDE LASER FOR  
VARIATION OF FREQUENCY OF DIODE EMISSION THROUGH  
SMALL CHANGE IN CURRENT DENSITY  
A66-38920
- THRESHOLD AND POWER CHARACTERISTICS OF GALLIUM  
ARSENIDE DIODE LASER OPERATING IN PULSED REGIME  
A67-10066
- CURRENT INJECTION EFFECT ON TIME DELAY OF GA AS  
LASER RADIATION A67-10083
- OPTICAL COUPLING USING GALLIUM ARSENIDE LASER FOR  
VARIATION OF FREQUENCY OF DIODE EMISSION THROUGH  
SMALL CHANGE IN CURRENT DENSITY  
A67-16390
- ZAKHAROV, S. D.**  
THRESHOLD AND POWER CHARACTERISTICS OF GALLIUM  
ARSENIDE DIODE LASER OPERATING IN PULSED REGIME  
A67-10066
- ZAKHAROV, V. P.**  
LASER BEAM-INDUCED RECRYSTALLIZATION OF AMORPHOUS  
GE SEMICONDUCTOR THIN FILMS PREPARED BY THERMAL  
DEPOSITION ON GLASS A67-13839
- ZAKREVSII, S. V.**  
LASER-GENERATION-TYPE LUMINESCENCE CD S- CD SE  
CRYSTALS EXPOSED TO DOUBLE PHOTON EXCITATION FROM  
RUBY LASER A66-27647
- FRACTURE MECHANISM OF TRANSPARENT CRYSTALS  
INTERACTING WITH RUBY LASER BEAM  
A67-13128
- LUMINESCENCE IN CADMIUM SULFIDE MIXED CRYSTALS OF  
WIDELY VARYING COMPOSITION IN PRESENCE OF  
EXCITATION BY RUBY LASER EMISSION  
A67-13153
- ZAROWIN, C. B.**  
THREE NEW VISIBLE CW LASER LINES IN DISCHARGE IN  
SINGLY-IONIZED CL A67-10373
- ZBOROVSKII, A. A.**  
RELAXATION TIME FOR RECOMBINATION RADIATION FROM  
SEMICONDUCTOR SOURCE DETERMINED BY MEASURING  
CURRENT/EMISSION PHASE SHIFT A66-29704
- ZEIDLER, G.**  
PUMPING NEODYMIUM LASERS THROUGH USE OF COHERENT  
EMISSION OF RUBY LASERS, FINDING THRESHOLD ENERGY  
A66-27605
- AXIAL AND TRANSVERSE MODE SELECTION, EMISSION  
SPECTRUM AND TRANSIENT EMISSION BEHAVIOR OF  
CONFOCAL RUBY LASER OPERATED IN ELLIPSOIDAL  
PUMPING SYSTEM A66-27606
- GIANT PULSES FROM NEODYMIUM GLASS LASER PUMPED BY  
GIANT PULSES FROM RUBY LASER A66-31354
- RUBY LASER PUMPING SYSTEM AND LOW COST MERCURY  
FLASH TUBE WITH HIGH REPETITION RATES USED FOR  
MICROMACHINING PROCESS A66-40336
- ZEIGER, H. J.**  
MASER AMPLIFIER BASED ON UV CONTINUUM PUMPING  
FROM NEARBY STARS, EXPLAINING 18-CM OH EMISSION  
FROM ANOMALOUS H-2 REGIONS A66-43042
- ZEIGER, S. G.**  
GENERATING MODE NUMBER IN SOLID STATE LASERS USING  
TRAVELING WAVE AND STANDING WAVE A67-10069
- COMPETITION OF TWO TYPES OF OSCILLATIONS IN  
TRAVELING WAVE LASER A67-10362
- COMPETITION OF TWO TYPES OF OSCILLATIONS IN  
TRAVELING WAVE LASER A67-17620
- ZHELNOV, B. L.**  
TRAVELING WAVES INTERACTION IN GAS LASER,  
EXPLAINING FORCING-OF-OSCILLATIONS AND TRAVELING  
WAVE SUPPRESSION EFFECT A66-34685
- TRAVELING WAVES INTERACTION IN GAS LASER,  
EXPLAINING FORCING-OF-OSCILLATIONS AND TRAVELING  
WAVE SUPPRESSION EFFECT A67-14371
- ZHUKOV, A. A.**  
TREATMENT OF STEEL WITH LASER BEAM, OBTAINING  
PRECISION HOLES WITHOUT AFFECTING MICROHARDNESS OF  
METAL A67-18234
- ZIEGLER, X.**  
HIGH-POWER MOLECULAR LASER BASED ON VIBRATIONAL-  
ROTATIONAL ENERGY LEVEL, NOTING CARBON DIOXIDE-  
NEON-HELIUM LASER DESIGN A66-33248
- ZINGERY, W. L.**  
AMPLITUDE AND FREQUENCY CHARACTERISTICS OF  
TRAVELING WAVE RING LASER A67-15777
- ZIRKLE, R. E., JR.**  
LASER OPTICAL RADAR USED FOR CLEAR AIR TURBULENCE  
DETECTION  
AFCRL-66-115 N66-38204
- ZITTER, R. N.**  
I R AND VISIBLE HELIUM-NEON LASER MODULATION USING  
FARADAY ROTATION IN YIG A66-26881
- ZNAMENSKII, V. B.**  
RELATION BETWEEN LASER PARAMETERS AND CATHODE  
DIAMETER IN EXCITATION OF HE- NE MIXTURE BY  
DISCHARGE OF HOLLOW CYLINDER A66-29357
- RELATION BETWEEN LASER PARAMETERS AND CATHODE  
DIAMETER IN EXCITATION OF HE- NE MIXTURE BY  
DISCHARGE OF HOLLOW CYLINDER A66-37361
- ZOLOTOV, E. M.**  
RUBY LASER RADIATION EFFECT ON FLUORESCENCE AND  
LASER ACTION IN DYSPROSIUM DOPED CALCIUM FLUORIDE  
CRYSTALS A66-37656
- ZORY, P.**  
INTRACAVITY INTERFEROMETER LASER MEASUREMENTS OF  
POWER GAIN AND OUTPUT IN SINGLE-FREQUENCY AR  
LASER AND 6328-ANGSTROM NE ISOTOPE SHIFT A66-40110
- ZUBAREV, I. G.**  
ADJUSTMENT PROCEDURE FOR LASER WITH POLYGONAL  
RESONATOR, NOTING SPATIAL MIRROR ADJUSTMENT IN  
ADDITION TO ANGULAR ADJUSTMENT A66-25323
- SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-  
PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION  
A66-27187
- GENERATION IN CADMIUM SULFIDE DURING TWO-PHOTON  
OPTICAL EXCITATION BY RUBY LASER WITH MODULATED  
Q-FACTOR A66-33134
- SPECTRAL CHARACTERISTICS OF TWO-PHOTON OPTICAL  
EXCITATION AND LIGHT EMISSION FROM CD SE  
SEMICONDUCTOR LASER WITH MODULATED Q-FACTOR  
A66-37565
- SEMICONDUCTOR GA AS QUANTUM GENERATOR WITH TWO-  
PHOTON ABSORPTION OF NEODYMIUM LASER EMISSION  
A66-43085
- ADJUSTMENT PROCEDURE FOR LASER WITH POLYGONAL  
RESONATOR, NOTING SPATIAL MIRROR ADJUSTMENT IN  
ADDITION TO ANGULAR ADJUSTMENT A67-10162

SPECTRAL CHARACTERISTICS OF TWO-PHOTON OPTICAL  
EXCITATION AND LIGHT EMISSION FROM CD SE  
SEMICONDUCTOR LASER WITH MODULATED Q-FACTOR  
A67-15299

SEMICONDUCTOR LASERS USING SINGLE AND DOUBLE  
PHOTON OPTICAL EXCITATION  
A67-18930

## ZUEV, V. S.

TIME PARAMETERS OF POWERFUL LASER MEASURED WITH  
GA AS PHOTODIODE, NOTING TIME CONSTANT AND TIME  
RESOLUTION OF PHOTODIODE  
A66-27750

PROPAGATION RATE OF HIGH POWER LASER LIGHT PULSE  
IN INVERSELY POPULATED MEDIUM  
A66-29980

LASER OPERATED WITH SATURABLE FILTER FOR Q-  
SWITCHING, NOTING TWO MODES OF EXCITATION /SOFT  
AND HARD REGIME/  
A66-32314

NONLINEAR AMPLIFICATION OF LIGHT PULSE PASSING  
THROUGH LASER OPERATING AT SATURATION REGIME  
A66-39542

GIANT PULSE GENERATION RANGE IN TRANSVERSE  
DIRECTION AFTER Q-SWITCHING IN RUBY LASER,  
EXAMINING RESONATOR PROPERTIES  
A66-42516

RADIATION OF GIANT PULSES OF SUPERLUMINESCENCE BY  
HIGHLY EXCITED ACTIVE MEDIUM OF ND GLASS WITH  
RAPID CUT-IN OF AMPLIFICATION  
A66-42755

RADIATION OF GIANT PULSES OF SUPERLUMINESCENCE BY  
HIGHLY EXCITED ACTIVE MEDIUM OF ND GLASS WITH  
RAPID CUT-IN OF AMPLIFICATION  
A67-10837

SHORT PULSE Q-SWITCHED LASER WITH VARIABLE PULSE  
LENGTH  
A67-16641

## ZUYEV, V. S.

DESCRIPTION OF RUBY LASER USED IN OPTICAL LOCATION  
OF MOON  
NASA-TT-F-8866  
N66-29428

## ZVEREV, M. M.

LASER ACTION IN ZINC SELENIDE CRYSTALS AT 4600  
ANGSTROMS PREPARED UNDER HIGH PRESSURE IN CLOSED  
CONTAINER BY GAS PHASE REACTION AND FOLLOWING  
CRYSTALLIZATION  
A67-20183

## ZYMCZAK, H.

EIGENVALUES AND EIGENFUNCTIONS OF SPIN  
HAMILTONIAN AND MATRIX ELEMENTS OF SPIN OPERATOR  
OF RUBY  
A66-37584